

INDIAN IRRIGATION COMMISSION
(1901-02)

MINUTES OF EVIDENCE

CENTRAL PROVINCES.



CULCUTTA:

OFFICE OF THE SUPERINTENDENT, GOVERNMENT PRINTING, INDIA
1903.

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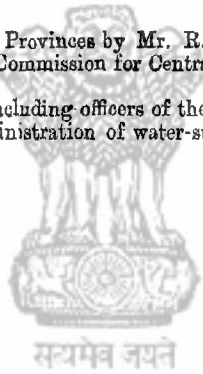
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FIFTY-FIRST DAY.

Nagpur, 4th March 1902.

Witness No. 1.—Mr. G. M. HARRIOTT, M.I.C.E., C.I.E., Executive Engineer, Public Works Department, Central Provinces.

Replies to printed questions.

1.—The answers below refer to the whole of the Central Provinces except where special districts are named.

I have been 23 years in the Central Provinces, during which period I have served in 14 out of its 18 districts, as well as in the Feudatory States and Zamindars of Chhattisgarh. Eleven years of my service have been in the rice districts of Chhattisgarh.

Since May 1901, as Second Secretary to the Hon'ble the Chief Commissioner, Central Provinces, Public Works Department, Irrigation Branch, I have had the opportunity of carefully considering the possibilities of irrigation in their districts, and divisions; with all the Commissioners, Deputy Commissioners, several Settlement Officers, and a large number of subordinate Revenue officials.

I have also had the opportunity of discussing the question of irrigation at meetings with these officers, and a number of the leading malguzars in the 11 districts noted below :—

- | | |
|--------------|------------------|
| 1. Bhandara. | 6. Sambalpur. |
| 2. Balaghat. | 7. Jubbulpore. |
| 3. Chanda. | 8. Damoh. |
| 4. Raipur. | 9. Saugor. |
| 5. Bilaspur. | 10. Hoshangabad. |
| | 11. Nimar. |

2.—The accompanying Table I gives full details of the average rainfall of the whole Province for 33 years—1867 to 1899.

Table II gives the average maximum, and minimum rainfall, for each month of the year, for each district in the Central Provinces. Those figures have been deduced from the records of 33 years, namely, 1867 to 1899.

3.—As to the extension of irrigation—

- (1) In the Central Provinces it is more a question of the introduction, than of the extension of irrigation. The lands which it is proposed to protect by irrigation are already sufficiently populated and cultivated.

In the Chanda District alone, does there seem to be any question of sufficiency of population, and this refers only to the uncultivated areas. The cultivated areas are sufficiently populated.

In the year 1894-95, which was a good average year, only 3.5 per cent. of the total cropped area of the Province was irrigated.

In the year 1899-1900, which was one of severe drought, only 1.4 per cent. was irrigated.

Sparsity of population has therefore not been any obstacle to the extension of irrigation.

- (2) The insufficient supply of cattle does not appear to have prevented the extension of irrigation. The land is already cultivated, and irrigation will make its cultivation easier. At present cattle suffer if rain does not come seasonably and in sufficient quantity to soften the soil for ploughing.

- (3) Neither is the extension of irrigation retarded by the supply of manure being insufficient. Little or no manure is used in the cultivation of rice. Without the application of any more manure than he uses now, a cultivator can with the help of irrigation alone raise the yield of one acre of rice from 900 lbs. to 1,500, 2,000 and even 3,000 lbs. per acre. (See my Note on Irrigation in the Central Provinces, Section XII, paragraph 116, page 43.)

The same is the case with wheat. With the aid of irrigation alone the cultivator can double the yield from wheat. (See my Note on Irrigation in the Central Provinces, Section VII, paragraph 51, page 19) and my Notes on Irrigation in the Saugor, Damoh, Hos-

hangabad and Nimar districts. In these districts the malguzars state, that the average yield from an acre of wheat can be nearly doubled by irrigation, and raised from 600 to between 1,000 and 1,200 lbs.

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The supply of manure in the Province is limited, and there is no doubt that if more were available, and it were applied to the fields, the yields from the crops might be still further improved. But the additional yields due to irrigation alone, are sufficient to repay the cultivator handsomely for the cost of irrigation.

There is no reason therefore why the limited supply of manure should retard the introduction and extension of irrigation.

- (4) That the unsuitability of the soil has not retarded the extension of irrigation in the Central Provinces is clearly shown by the following figures.

The year 1894-95 was considered a good average agricultural year. The following areas were under the crops mentioned, and irrigation could without doubt have been applied to the whole of these lands. Yet only the percentages of them given below were irrigated :—

Lands.	Acres under the crop.	Acres irrigated.	Percentage irrigated.
Rice lands	4,533,400	531,907	11.73
Garden lands	608,012	75,028	9.00
TOTAL	5,339,412	606,933	

Besides these lands, there were 2,588,992 acres under wheat, of which at least half is unembanked land, and it seems that this might have been irrigated; but practically none was irrigated. The question as to whether such lands can be irrigated is however disputed.

Of the 5,339,412 acres noted above that could have been irrigated in 1894-95 (excluding the wheat areas), only 255,264, or 5 per cent. were irrigated in the year of drought 1899. Certain crops like juar and cotton grown on black cotton soil, and wheat when grown on embanked black soil fields, do not as a rule need irrigation even in dry years.

It has also been held by Revenue officers, that irrigation cannot be applied at all to wheat grown on black cotton soil, as it will increase the risk of rust, and do no good without manure. But the malguzars of Damoh, Saugor, Hoshangabad and Nimar, all black cotton soil and wheat-producing districts, state that this is only the case where the wheat fields are bunded. That where wheat fields in black cotton areas are not bunded, irrigation can be applied to the crop without increasing the risk of rust, and the yield nearly doubled thereby. (See Appendix I, paragraph 2, of my Notes on Irrigation in the Saugor, Damoh, Hoshangabad and Nimar districts.)

Mr. W. N. Maw, I.C.S., Deputy Commissioner of Damoh (see Appendix II of my Note on Irrigation in the Damoh District, paragraph 32), after consulting the malguzars of that district, writes regarding the irrigation of wheat on black cotton soil, that "they were not so much impressed with the danger of causing rust to

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the crops as I had anticipated. In fact they said that they would not be so blind to their interests, as to irrigate in years when irrigation was not required."

Mr. W. M. Crawford, I.C.S., Deputy Commissioner of Nimar, writes (see my Note on Irrigation in the Nimar District, Appendix II, last paragraph) that "it is true that rich soil requires little and careful irrigation; but the fact that it cannot be irrigated is not generally admitted. There is no doubt that in years of scanty rainfall, or early cessation of the rains, great advantage would be taken of irrigation wells for the protection of wheat and other rabi crops."

At an Irrigation meeting held by the Deputy Commissioner, Mr. C. E. Low, I.C.S., at Hoshangabad, a large number of malguzars were present; and they were unanimous in their opinion, that wheat grown on black cotton soil, can be, and is, irrigated with advantage even in normal years. To test their statements, Mr. Low specially selected Seetaram, malguzar of Kota (on the Ganga River) whose lands are composed of very deep, pure, black cotton soil. Instead of traversing the statements of the others as was anticipated, he confirmed them, and said that he had been irrigating wheat with advantage even in years when there was good winter rain.

The evidence of the malguzars in the four districts mentioned, goes to show that wheat grown on black cotton soil in unembanked fields, is, and can be, irrigated, with advantage, once or twice every year. And this evidence is in my opinion, confirmed conclusively, by the fact, that the embanking of such fields is strongly recommended by both Revenue officers and cultivators. This is really a system of irrigation, and is equivalent to flooding the fields thoroughly in the month of October before sowing. So that such fields are really well watered once in October every year, no matter what the rainfall is. In the case of bunded fields the water is stored on them to some depth, and they are drained before sowing. The water run-off is used to irrigate fields of black cotton soil for wheat below them. The watering in the bunded fields is therefore so thorough, that no more irrigation is needed for the crop subsequently. But where the fields are not bunded so much water cannot be put on them, the soil therefore dries quicker, and the crops benefit by light waterings in November, December, and January, if the rainfall is not heavy, which it seldom is. A second watering in one or other of these months is therefore necessary and beneficial every year.

By reference to my Note on Irrigation in the Central Provinces, Section VII, paragraph 48, it will be seen, that the evidence then before me seemed to show so conclusively, that irrigation should not be applied to wheat grown on black cotton soil except in years of drought, that I accepted it. But after considering the subject carefully with the malguzars of the above four districts, I have no doubt, that wheat grown on unembanked black cotton soil, can be successfully and advantageously irrigated even in normal years. Cultivators will only irrigate such lands in bright dry weather, and not when there is any prospect of wet cloudy weather. The risk of rust attacking the crop will, therefore, not be increased in the least.

The Executive Engineer, Betwa Canal, states (see my Note on Irrigation in the Central Provinces, Appendix XIII, page 100, question 5), that wheat grown on black cotton soil, called kabhar, has been regularly watered for "Paleo" since 1896, and while growing when winter rain is insufficient. Mechanical analysis shows that this soil contains 89.50 per cent. of clay, while the best black cotton soils of Hoshangabad and Damoh districts contain on an average 60.90—59.92 and 36.62 per cent., respectively, and therefore court irrigation more (see

paragraph 6 of my Note on Irrigation in the Hoshangabad District).

(5) I do not think that the uncertainty of the water-supply has had any influence in obstructing the progress of irrigation. The water-supply in the Province is generally plentiful, and it is only comparatively small in years of drought. Failures of crops are caused, more from unseasonable, than from deficient rainfall.

The late commencement of the rains does not harm the crops much, the sowings are retarded but the crops do not suffer, unless the rains close too early. Sowings are however generally effected in fairly good time, as very little rainfall is needed for them.

Early cessation of the water-supply only retards the progress of one system of irrigation, namely, that of direct irrigation from streams. And even this system is only affected in years of drought. In normal years, the main streams generally hold sufficient supplies to the end of the agricultural season. But as the rainfall in these Provinces is comparatively good, the early cessation of the rains cannot obstruct the extension of irrigation from storage works.

(6) Lack of capital for initial expenditure has undoubtedly retarded the construction of irrigation works. Where cultivators have been able to afford the initial expenditure, and where it has been possible in rice areas to get suitable sites in their village lands, they have constructed tanks to improve and protect their crops. In wheat areas they have bunded their fields. In fact, there are many cultivators like Nathu Ram of Saugor, who have run heavily into debt, to improve their lands by irrigation.

At present, irrigation is not sufficiently extensive in the Province to admit of expensive cultivation.

(7) Fear of enhanced rent and revenue assessment has, I think, retarded the extension of irrigation to some extent. At the Irrigation meeting held in Khandwa in the Nimar District, the malguzars gave this as a reason why more wells were not constructed. They said they had to borrow the money and construct the works, and then the State enhanced their rents at the next settlement. That they did not mind enhancement of rents if the State constructed the works. When informed by the Assistant Settlement Officer that the rents were not enhanced in such cases till the second settlement after the improvement, they said they did not think this was generally known by cultivators. [See my Note on the Irrigation on the Nimar District, paragraph 20 (ii), and Appendix I, paragraph 9, (viii).]

(8) This is a question I have not gone into in detail, though I have been informed on several occasions that the possibility of being deprived of their holdings prevents tenants improving their lands.

(9) I think that the extension of irrigation in the Central Provinces has been retarded for the following further reasons:—

(a) Inaction on the part of the State Irrigation works of any magnitude can, I think, only be successfully constructed and managed by the State.

(b) The cultivators lack combination. Individually they cannot afford to construct works of any magnitude, and it is practically impossible for them to combine their resources to construct them. Even if they could be induced to combine to construct large irrigation works, the State would have to help them professionally in their construction, and supervise their management.

(c) In the case of private works, it is difficult to carry water across other peoples' lands to irrigate fields beyond. Unless the State steps in in such cases, the difficulty is insurmountable.

(d) The cultivators do not seem to be well acquainted with the rules for "Takavi" for land improvement. At irrigation

meetings held in Saugor, Nimar, and Hoshangabad, the malguzars were under the impression that the period for the repayment of such loans was five years, that recoveries began the second year after the loan was given, and that the rents of the lands were liable to be enhanced at the following settlement. If effective steps are taken to make the rules for land improvement loans well known in every village, I think they will help considerably to extend minor irrigation works.

- (e) Finally, I think the extension of irrigation is retarded to some extent by the lack of initiative in the cultivators. They want some one to gain their confidence, to advise them, to show them how they can improve their position, and help them to do so. They will be slow to move at first, but once their doubts and fears are set aside, irrigation will extend rapidly. In fact, it should be some one's duty in each district to see that irrigation is extended. Its extension should not be left entirely to the cultivators. Once these officers gain the confidence of the cultivators, I have little doubt that they will be able to get them to combine to construct large works.

4.—I understand that land which is irrigated from works constructed by private capital, are exempted from enhancement of assessment on account of irrigation, till the second settlement after irrigation has been applied. This seems a very liberal period of exemption if it is fully secured in practice to the cultivator. A settlement usually runs over 10 years, so if a cultivator applies irrigation to his lands immediately after one settlement, he can secure exemption from enhancement for a maximum of 20 years. If he applies it immediately before a settlement he secures a minimum period of exemption of 10 years.

The only objection I see to the above arrangement is that the same period of exemption cannot be secured in practice for every improvement, and it must have the tendency to retard progress in agricultural improvements when a re-settlement is approaching. I would recommend, if it can be effected, that the period of exemption be fixed at 20 years. That, on the completion of the improvements, sanads be given to the cultivators, and that the enhanced assessments be not applied till the 20th year from the date of the sanad has expired. The enhanced assessment can be fixed at the re-settlement immediately before it will be applicable; and applied when the period of 20 years expires. This arrangement will, I think, ensure the same period of exemption to all improvements, and secure uniformity in progress. It will also, I believe, inspire confidence, by showing the cultivator that his improvement has been recorded, and that his exemption for 20 years is substantially guaranteed. The necessity for this is, I think, brought out in the following extract from the Report on the re-settlement of the Nimar District of the Central Provinces, 1895 to 1898.

"At the next re-settlement, attention must be paid to numerous sanads issued for improvements completed after the attestation of the villages. As these will be also entitled to exemption during the next re-settlement,—care will be needed to distinguish these improvements, from those which were made before this re-settlement, and are only exempted for its term."

It seems evident that if the exemption sanctioned by the State was effectively secured in practice, there should be no necessity for a Settlement Officer to enter such a warning in his Settlement Report. His remarks seem to be the outcome of difficulties experienced by him in meeting claims for exemption. Moreover, if the sanads given for land improvements are as useful as they should be, they should leave no doubt as to the end of the period of exemption. Any doubt of this kind shakes the confidence of the cultivators, and must be avoided if success is to be secured.

5.—From information I have gathered at the Irrigation meetings in several districts, it is evident that loans are not taken freely under the Land Improvement Act for the extension of irrigation. On the contrary, loans for this purpose are taken to a very limited extent.

From the opinions expressed by the malguzars I conclude that they are not taken for the following reasons :—

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- (a) The conditions under which such loan can be obtained are not sufficiently well known. Even malguzars at the meetings showed marked ignorance regarding them. Steps should be taken to see that the conditions are known and understood in every village.
- (b) There appears to be a certain amount of trouble and delay in obtaining the loans, which seem to deter cultivators from trying to get them. These should be minimised.
- (c) The amounts of such loans are limited to three times the rental of the holdings. If a sum in excess of this is applied for, the cultivator has to provide adequate security, which it is in most cases difficult for him to do. This seems a weak point in the rules which deserves consideration. For example, a well can irrigate 6 acres of land. The rental of these 6 acres is not likely to exceed Rs. 12. A good but poor cultivator, holding this area, and wishing to apply irrigation to it, can only obtain Rs. 36 as "Takavi," under the Act. But a durable well costs Rs. 300 to construct. He must, therefore, find security for the remaining Rs. 264 or give up the improvement of his land. He cannot do the former, and so gives up the improvement.

If the land is black cotton growing wheat, he might improve it by bunding; but that costs from Rs. 10 to Rs. 25 an acre. Taking Rs. 20 as the average cost, he would require Rs. 120 to improve the 6 acres, and he can only get Rs. 36.

It may be possible for the cultivator in some cases to get the security. But this generally means additional expense, trouble, and delay, which, to say the least, aids his procrastinating tendencies, and he defers his good intentions indefinitely.

If the extension of irrigation by means of "Takavi" loans under the Land Improvement Act is to be encouraged, it must, I think, be possible for a cultivator to obtain a sufficiently large loan to cover the cost of constructing a work to irrigate the area he wishes to improve.

In the case of bunded fields I would fix the average at Rs. 20 per acre.

For wells the average cost seems to be approximately Rs. 50 per acre.

- (1) Except in the Saugor District, the malguzars at the Irrigation meetings did not seem to object to the rate of interest charged by the State, for such loans.

In Saugor they said that it would pay Government to give the loans without interest, and gave as their reason the fall in the land revenue in the Khurai Tahsil. Owing to abatements, the land revenue in the Khurai Tahsil alone, in the district, has fallen from Rs. 1,24,734 to Rs. 52,980 per annum, or more than 50 per cent. While in four of Nathu Ram malguzar's villages in the same tahsil, namely :—

- | | |
|--------------|------------|
| 1. Barodia, | 3. Gulowa, |
| 2. Nawagaon, | 4. Subela, |

there has been no abatement, owing mainly to the land improvements he has carried out [see Appendix I, paragraph 9 (viii) of my Note on Irrigation in the Saugor District].

This is a very strong argument; but judging from the view taken of the subject by the majority of the malguzars, I think that a reduction of the rate of interest to Rs. 0-4-0 per cent. per month, or Rs. 3 per cent. per annum, should secure the object in view.

- (2) Though I think it would pay the State to give "Takavi" without interest for the protection of land by irrigation, I am of opinion that it would demoralise the cultivator, and that it is not absolutely necessary to secure the object aimed at. I cannot, therefore, recommend the entire remission of interest for future advances.

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But I gather that there are cases (Nathu Ram, malguzar of Saugor is one) in which malguzars have in the past, on their own initiative, taken "Takavi," improved their lands, and have carried their holdings through some 7 or 8 years of continuous bad seasons so well, though it has run them into heavy debt, that little or no abatement of revenue has been necessary.

In such cases, I think, that total remission of interest on past loans will not only help them to get out of debt, but it will stimulate them to make further improvements.

- (3) At the Irrigation meetings held at Damoh and Nimar, the malguzars recommended that in the case of poor cultivators with small holdings, half of the advance should be a grant-in-aid. That these people cannot carry out improvements entirely at their own expense, but that when the State assists them with half the cost as a grant-in-aid, it may reasonably stipulate for supervision, to see that the whole of the funds are spent on the works, and that they are properly constructed and maintained. [See my Note on Irrigation in the Nimar District, Appendix I, paragraph 9 (viii).]

I think that some such further concession is necessary in the case of cultivators with small holdings, and limited means, and I would recommend the following course in such cases:—

- (a) That half the advance be given, under the general conditions that may eventually be sanctioned for such loans.
- (b) That half be given as a grant-in-aid.
- (c) That in consideration for the above concession, the State have the right to see that the whole of the advance is utilised on the work, and that it is properly constructed and maintained.
- (d) That the supervision be exercised by the State, if possible, through a malguzar.
- (4) Total remission in the case of failure of the attempt to obtain water, unless conditional, is liable to lead to reckless attempts to do so.

There is no doubt that some concession of this kind is necessary, for at the meeting at Khandwa, the malguzars quoted cases in which laudable attempts to extend well irrigation ended in considerable loss, owing to failure to get water.

I would recommend that total remission in the case of failure to obtain water, be only made in cases where State advice and assistance is sought before the work is begun, and acted on.

In districts where well irrigation can be extended to any great extent, like Nimar, Hoshangabad, Saugor, and Damoh, I would recommend that a small staff of well-borers, and a supply of boring tools, be kept up by the State. (See my Note on Irrigation in the Central Provinces, Section VIII, paragraph 80, page 29) to help cultivators to test and select sites for wells. The malguzars, especially in Nimar where there seems to be the greatest prospect of extending well irrigation, were generally of opinion, that such a staff would be most helpful, and would be freely used by people wishing to construct wells. With aid of this nature, failures to obtain water, and consequent remissions of advances, will be very rare.

- (5) I understand that under the Land Act the period of repayment can be 15 years, and that this may be extended under special sanction where necessary to 35 years.

The malguzars seem very ignorant of these conditions, and generally believe that the period of repayment is limited to 5 years. They consequently ask for the period of repayment to be extended to 10 years, and for the repayments to begin 3, instead of 2 years, after the advance is taken.

The above periods of repayment, namely, 15 to 35 years, seem all that is desired by the cultivators. The extension of the period of the commencement of the repayments to 3 years, should, if possible, be sanctioned. It will give a cultivator time to begin reaping the full benefits of the improvement, before he has to begin repaying the advance.

- (6) I would only recommend grants-in-aid being given to poor cultivators with small hold-

ings, conditionally, as recommended in my reply to question 5 (3).

6.—In the Central Provinces the problem at present is to apply irrigation to land already cultivated. There will be no inducement for people to leave their lands elsewhere, and go to tracts where irrigation is applied, as there will be no land available for them.

The malguzars of all the 11 districts in which Irrigation meetings have so far been held, are most anxious to have the means of irrigation extended to them. And I have no doubt that the same spirit will be evinced in 5, if not 6, of the remaining districts. The people of the Wardha District alone may not evince any desire for the extension of irrigation, because the soil in it is black cotton, and the crops almost wholly juaari and cotton, which hardly need irrigation even in years of drought. But I will not be surprised if it is found, that even the people of Wardha favour an extension of well irrigation.

7 to 11.—

There are no canals of continuous or intermittent flow in the Central Provinces.

C. (1) & (2).—There are a few instances in the rice districts, where small temporary dams are constructed across very small streams, and their waters diverted to feed tanks, and even to irrigate fields direct. But these are very insignificant.

In such cases the dam generally consists of stones, rushes and earth. The water is carried along a contour channel to a tank, or turned direct on to the fields.

In the former case the water is stored in the tank till required, when it is drawn off as described under tank irrigation.

In the latter case it is run on to the higher fields, and allowed to flow through them to the lower ones. The maintenance of the supplies for such sources depend entirely on the nature of the rainfall during the monsoon. In the year of drought, there is practically no rain after August. In a year of scanty rainfall, there is very little rain in September. In a good year rain is plentiful in October.

12.—(a) In a year of ample rainfall, the supply in such streams, as are used in this way, is generally maintained to some extent in December.

(b) In year of scanty rainfall, if the rains stop early, their supplies may fail towards the end of October, or in November.

(c) In a year of drought, they may fail in the latter half of September, or beginning of October.

D.—TANKS.

23.

(1) Tanks in the Central Provinces are all private property, and they are used for irrigation chiefly in the rice growing tracts. The following answers refer to that crop.

They are supplied with water, it may be said, entirely by the off-flow from the rainfall on their catchment areas, during the monsoon months June to October inclusive.

In an inappreciable number of cases, the drainage from small streams outside of their catchments is diverted into them by contour channels.

(2) In ordinary times when the tanks are full, and there is a flow of surplus water over the waste-weir, this water is led on to the higher fields, and allowed to flow through them to the lower ones.

When there is no surplus flow, and the crops require irrigation, in most cases the water is drawn off from the tanks, by making a cut in the embankment from 2 to 2½ feet wide.

The supply is run through this cut on to the highest fields it can reach, and runs through them on to the lower-lying ones.

A very few of the larger tanks are provided with rough masonry sluices called "Moghas," through which the supply for irrigation is drawn off when there is no surplus flow.

(3) The rainfall, except in years of drought, is generally sufficient for agricultural requirements in June, July and August. It is in September and October that it is deficient and unseasonable. (See Section V of my Note on Irrigation in the Central Provinces, pages 7 to 11.)

(a) In a year of ample rainfall, water is only required from the tanks for irrigation, if the former is unseasonable, which is generally the case in September or October. There are very few years when the rainfall, though otherwise plentiful, is sufficient in the

month of October. And most of the existing tanks seem to have been constructed to meet this deficiency. One watering is generally required for rice in this month. When the rainfall is unseasonable in September, which is about every three years, a watering is needed in that month too.

(b) In a year of scanty rainfall generally two waterings are needed for rice in September, and one in October.

(c) In a year of drought from 4 to 6 waterings are generally needed according to the class of rice sown. Broadcasted rice generally requires four waterings, namely one in July or August, and three in September and October. Transplanted rice requires three in July and August, and three in September and October. (See Section IX of my Note on Irrigation in the Central Provinces, pages 31 to 35.)

(4) The following figures show the areas ordinarily irrigated from tanks in the Central Provinces. The year 1894-95 was a good average year, while the year 1899-1900 was a year of drought:—

Years.	Number of irrigation tanks in operation in the Province.	Average area irrigated by each tank.
	No.	Acres.
1894-95	31,994	17.0
1899-1900	31,338	5.7

(See my Note on Irrigation in the Central Provinces, Section VI, paragraph 32, page 13.)

24.—The extent to which irrigation increases the value of the produce of land, depends both on the soil and crop irrigated. In my Note on Irrigation in the Central Provinces, Section XII, paragraphs 114 to 124, pages 42 to 45, full details are given of the increase in value of the produce, as far as rice lands are concerned. If the chief crops which can be irrigated, namely, wheat and rice are considered, the following are the main details.

(1) On rice lands, irrigation will increase the present area under double crops 25 per cent. at least.

At present in years of drought, the area under double-crops falls to 9½ per cent. of what it is in normal years. Irrigation will therefore not only increase the double-cropped area 25 per cent.; but keep it at the maximum in years of drought. The net return to the cultivator from this second crop must be from Rs. 6 to Rs. 10 per acre. So that in years of drought, and those of scanty rainfall, irrigation will save him the above amounts, per acre, where he double-crops already. And it will add them to his annual income, for any additional area that irrigation may enable him to double-crop.

In wheat lands, irrigation will allow the cultivator to take a catch-crop of rice, as is now done in the "Haveli" or bounded fields of Jubbulpore, Bhandara, Narsinghpur, and other wheat districts. The net profit to the cultivator from such a catch-crop of rice, I estimate at approximately Rs. 12 per acre.

(2) It is difficult to form a general estimate of the increase in value of the produce of land, due to the substitution of more valuable crops; for this varies both with the soil and the crop substituted. For instance, the best rice cannot be grown on all lands simply with the application of irrigation. Heavy rice can replace medium rice, and the latter light rice. And transplanted rice can replace the better varieties of broadcasted rice. The following seem to be the approximate yields from the various classes of rice unirrigated:—

	5 lbs. per acre.	
Light broadcasted rice	600	Average 900 lbs.
Heavy broadcasted rice	1,200	
Light transplanted rice	1,000	Average 1,500 lbs.
Heavy transplanted rice	2,000	

The yield from the better classes of rice is so much higher than that from the lighter classes, that the substitution of the more valuable varieties, will add at least 250 lbs. per acre, to the yield of the lands on which the substitution can be effected. This is equivalent to approximately 3 maunds per acre. At Rs. 2 per maund, the value of the increase due to substitution of more valuable rice, will be Rs. 6, or say Rs. 5 per acre.

In the case of wheat, it does not seem possible to increase the value of the produce appreciably by substituting more valuable varieties.

(3) Crop experiments have shown that with broadcasted rice in the Raipur District, unirrigated rice on matasi soil gave a yield of 1,134 lbs. per acre, while irrigated rice on the same soil gave 2,020 lbs.

In the Bhandara and other transplanted rice districts, the yield from transplanted rice unirrigated is about 1,250 lbs. per acre, and this can be raised by irrigation to 2,000 and 3,000 lbs. (See my Note on Irrigation in the Central Provinces, Section XII, paragraph 116, page 43.)

Estimating generally from the official averages for the districts, I make the average yields from rice per acre as follows:—

Unirrigated	1,200	} lbs. per acre.
Irrigated	2,250	

So that irrigation adds, on an average, about 1,000 lbs., or 12½ maunds per acre to rice. At Rs. 2 per maund the value of this comes to Rs. 25 per acre.

Taking a full crop at 16 annas, and a bumper crop at 20 annas in the rupee (to use the cultivator's mode of reckoning).

The crops gathered in the various years are estimated as detailed below:—

	Annas.	Per cent.
(a) In a year of ample rainfall	14	88
(b) In a year of scanty rainfall	8	50
(c) In a year of drought	4	25

Nearly all the irrigation at present is due to rainfall, and even in years when it is ample, it is not quite seasonable; and a full 16-anna crop is seldom gathered. For example, in the Raipur District the monsoon rainfall of 1896 was 55.98 inches, against an average for the district of 43.89, yet owing to it being unseasonable, the crops failed entirely, and there was famine. An average of 14 annas, or 88 per cent., is therefore generally the yield of a good year.

It takes very little to drop the yield from 14 to 8 annas. During a scanty year the rainfall is also more erratic, and the average yield in such a year seldom exceeds 8 annas, or 50 per cent. of a full crop.

The yield of a year of drought is not more than 4 annas, or 25 per cent.

Irrigation should insure a bumper crop every year. It will certainly insure a full 16-anna crop.

In the Balaghat District, Mr. Mayne, i.o.s., Settlement Officer, found from enquiries on the subject that from holdings on sehar land (poor soil) in which rice is grown as a single crop, the profit is Rs. 15 per acre. (See paragraph 35, page 12, of the Settlement Report on the Balaghat District for the years 1895-98). Mr. Scott, Settlement Officer, shows that even this is a low estimate. Allowing for higher profits for better soils, an average profit of Rs. 20 per acre seems a fairly accurate estimate.

The increased value of the yield from rice land due to irrigation, even supposing the increase in yield due to it is only estimated at Rs. 20, instead of Rs. 25, per acre, so as to allow a safe margin, may be estimated as follows:—

Rice Lands.

Years.	Saving on the unirrigated field.	Amount due to the increased yield from irrigation.	Total.
	Rs.	Rs.	Rs.
(a) In a year of ample rainfall	2	20	22
(b) In a year of scanty rainfall	10	20	30
(c) In a year of drought	15	20	35

In the case of wheat, the malguzars of Damoh, Saugor, Nimar and Hoshangabad state that irrigation will double the yield even in normal years.

The yield from this crop is not affected so much by years of scanty rainfall, or those of drought. Its yield in these years may be estimated at the following figures:—

	Annas.	Per cent.
(a) Year of ample rainfall	14	88
(b) Year of scanty rainfall	8	75
(c) Year of drought	4	50

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Mr. G. M. Harriott. The profits from its cultivation seem to be approximately as follows:—

4 Mar. 02.	Yield per acre unirrigated	600	lbs.
	Value at 12 seers per rupee, which is a low price	25	Rs.
	Deduct.		
	Seed at 120 lbs. per acre	5	Rs.
	Ploughing, &c.	5	
	Total	10	
	Profit	15 per cent.	

Irrigation is said by the malguzars to double the yield; but supposing it adds only 400 lbs. to the yield, the additional profit due to irrigation alone will be Rs. 17-8-0, say Rs. 17.

The increased value of the yield from wheat land due to irrigation, may therefore be estimated as follows:—

Wheat Lands.

Years.	Saving on the unirrigated field.	Amount due to the increased yield from irrigation.	Total.
	Rs.	Rs.	Rs.
(a) Year of ample rainfall	2	17	19
(b) Year of scanty rainfall	4	17	21
(c) Year of drought	8	17	25

From these figures the cost of irrigation per acre, which from tanks by flow should not exceed Rs. 3 (only Rs. 2 is recommended as a water-rate at present) must be deducted.

25.—(1) Irrigation in the Central Provinces being chiefly done by rainfall, is not affected much by late commencement of rain. The sowings are delayed a little till rain falls, and the crops are reaped a little later. Even where there are tanks, they are practically never used to irrigate for sowing.

(2) Early cessation of rains is the cause of most damage. It generally fails in September and October or is very unseasonable in September. It is to meet these deficiencies and breaks in the rainfall, that the existing tanks are generally used.

26.—In the Central Provinces the only irrigation done is from private tanks, and such irrigation is not supplemented by water from wells.

27.—(1) I estimate the increase in the total annual value of the produce per acre due to irrigation, as detailed below. These figures exclude the cost of irrigation.

(2) In the case of rice lands, double-cropping can only be effected on some soils, and the increase due to it cannot be estimated. It has therefore been omitted in the following statement:—

Periods.	Increase due to improvement in cropping owing to irrigation.	Increase due to additional yield due to irrigation.	Total.
	Rs.	Rs.	Rs.
(1) On the average of a normal term of years.	5	20	25
(2) In a year of drought.	5	35	40

In the case of wheat lands there seems no reason why the whole of the irrigated land should not be double-cropped as wheat is generally grown on black cotton soil: double-cropping has therefore been included in the following statement:—

Periods.	Increase due to double-cropping.	Increase owing to additional yield due to irrigation.	Total.
	Rs.	Rs.	Rs.
(1) On an average normal term of years.	12	20	32
(2) In a year of drought.	12	25	37

The above figures do not include the cost of tank irrigation. Rs. 3 per acre for irrigation from tanks will make projects pay well; but at present the maximum recommended is Rs. 2 per acre.

28 (1), (2) & (3).—There is no systematic irrigation done in the Central Provinces from State works.

Practically all the irrigation tanks are private property and the water from them is used to irrigate the owner's lands.

Water is only sold from a very few of the larger ones, and then only when it can be spared. All the details asked for cannot therefore be given as they are not available.

The only irrigation work in the Province under the supervision of any public body is the Lachora tank in the Nimar District. There the cultivators pay the District Council, under whose charge the tank is, the following water-rates per annum for the areas actually irrigated each year:—

	Rs.
Wheat	4 per acre.
Sugarcane	10 "

In Chandra District water is sold for irrigation at the following villages. The rates per acre actually irrigated each year:—

Sindawahi village—For rice	Rs. 3 per acre per crop.
Kucharpar „ —For sugarcane	Rs. 6-5-4 per acre per crop.

In the Bhandara District, the normal rate at which water is sold for rice irrigation from private tanks, is Rs. 2 per acre actually irrigated, per crop. The water is only given when the owner of the tank can spare it after watering his own fields.

During the famine of 1899 the malguzar of Jam sold water at Rs. 20 per acre for rice.

On the question of water-rates see my Note on Irrigation in the Central Provinces, Section XVII, paragraphs 150 to 157, pages 58 and 59.

29.—Wherever water is sold for irrigation, the owner of the fields has to arrange himself to convey it to his land.

30.—The cultivators have to clear their own channels, and do it themselves. No account of the cost is available. It is usually very trifling.

31.—As stated above the owners of land convey the water to the fields themselves, and allow it to run from field to field.

It occasionally occurs that a person who will not take water, owns land between the source of supply and the holdings of a cultivator who wants it, and the former will not permit a channel to be carried through his fields. There is an instance of this at Jam village in the north of the Bhandara District.

It is absolutely necessary that in such cases the State should step in, and make it possible for the channel to be constructed. Till this can be done, private enterprise in extending irrigation must be crippled.

32.—I think it is very advisable to encourage and assist the construction of tanks by private persons. Assistance must be given, encouragement alone will not, I think, secure the results sought.

I think this can best be done under the following conditions:—

(a) Advances for the construction of such works should be given on the most favourable terms possible.

(b) The land required for the construction of the work, if State property, should be given free.

If not State property, it should be acquired for the work on the terms of the Land Acquisition Act, or on the most favourable terms that may suit the case.

(c) Irrigation tanks cannot be constructed to give the best results possible, unless the lands are properly surveyed and levelled, and the works are properly designed. I think the State might do this portion of the work in the case of large tanks.

(d) The owners should be allowed to construct the tanks as economically as they can; but the State should have the work professionally supervised, to the extent of seeing that no error is made in construction which might lead to the destruction of the work. Such supervision might be given free of cost.

(e) Efforts should be made by officers who are entrusted with the task of extending irrigation to get malguzars to combine to

construct such works. In other countries land-owners combine in this way to carry out irrigation schemes, and there is no reason why it should not be done in India, if the fears and prejudices of the malguzars are overcome, and their confidence gained.

33.—I have heard of no difficulty being experienced from irrigation tanks silting up.

At Woraband, in the Raipur District, a very large and ancient tank was cut in 1896 to irrigate some fields by the Raja of Raj-Nandgaon; unfortunately the embankment was cut nearly at the centre, and the tank was drained. I had to get the embankment repaired for the Feudatory Chief, and saw the tank when empty. There was so little silt even near the embankment, that fishermen were able to wade into it up to their waists to catch fish. There did not seem to be more than from 5 to 6 feet of silt in the deepest part.

This tank is not used for irrigation. I do not think water was ever drawn off from it before for this purpose. Even on this occasion I have the best authority for stating that irrigation was only made an excuse to drain the tank. The Chief wanted to stock a new tank he had made near his palace with fish, and was advised that the best way to get large ones was to drain this tank.

There had, therefore, been no clearing or check on silting. It seems, therefore, that there need not be much fear from silt.

Beside irrigation, tanks may be occasionally emptied in dry years, and on such occasions the opportunity may be taken of clearing away silt deposits.

E.—WELLS.

34.—(1) The average depth of durable irrigation wells in the Damoh, Saugor, Nimar, and Hoshangabad Districts is estimated at 30 feet, and this is about the average for the Province. But they vary from 10 feet in depth on the lands near rivers in Hoshangabad to 40 feet on the higher lands.

(2) In most of the wells the supply is from percolation, and is likely to fail in years of drought, if they are not made sufficiently deep to reach the sub-soil water in such years. None of them fail in normal years. Nor does the water in them, as far as I know, become saline.

(3) The average cost of constructing such wells is estimated at Rs. 300 by the malguzars of the above districts. This seems to be approximately the average cost for the Province.

(4) I cannot say definitely, but many of the irrigation wells are very old.

(5) The water is generally raised by "Paccottah" and "Mot," and in some places by "Persian wheels."

(6) The average area attached to and commanded by each well cannot be given, as there is no record of these areas. It is, however, stated by the malguzars of the districts named above, that an average well can irrigate 4 acres of wheat in deep black cotton soil, and 8 acres in light soil, or an average of about 6 acres.

(7) In the year 1899, one of drought, the area irrigated from wells in the Central Provinces was 64,188 acres.

The number of wells used for irrigation in it were—

	No.
	13,286 durable.
	46,254 temporary.
Total	59,540

Therefore the average area irrigated by each well in that year was 0.77.

In the year 1894-95, which was an average year, there were 50,112 wells in use for irrigation, and 74,336 acres were irrigated. So that the average area irrigated by each was 1.50 acres.

But a large number of these wells are small temporary ones used for small patches of garden crops. These reduce the area irrigated per well considerably.

35.—It should be stated here that well irrigation is of little use for rice cultivation. It is used chiefly for wheat and other rabi crops which need much less water.

Its value is, therefore, estimated below on wheat, which is the principal crop irrigated by it.

(1) Beyond possibly a little garden produce, well irrigation does little towards the production of a second crop. Profit in this respect may be ignored as a margin of safety.

(2) In wheat the substitution of better varieties adds very little to the value of the crop. This may also be ignored as a margin of safety.

(3) The malguzars in Saugor, Damoh, Nimar and Hoshangabad, all state that well irrigation doubles the yield, and lessens the amount of seed required per acre. The average yield from unirrigated wheat is 600 lbs. per acre. This, it must be remembered, is for ordinary unbanded fields. So that on the malguzars' statements well irrigation adds 600 lbs. per acre to the yield.

In Nimar, where the soil is on an average not so productive as it is in Hoshangabad, Saugor and Damoh, some crop experiments showed that well irrigation raised the yield to 900 lbs. per acre. There seems little doubt, therefore, that on an average a yield of 1,000 lbs. per acre can be obtained by irrigating from wells.

In normal years it is seldom that a full 16-anna crop is reaped. On an average of normal years, a 14-anna crop is about what a cultivator gets from an ordinary unembanked, unirrigated field. Irrigation should help him to get a full 16-anna crop every year, so that it will add 2 annas on an average to the present normal yield.

Well irrigation will therefore increase the value of the produce of the unembanked wheat land per acre by increasing the yield to the extent estimated under question D 24 (3) as follows (see page 14).

	Rs.
(a) In a year of ample rainfall	19
(b) In a year of scanty rainfall	21
(c) In a year of drought	25

The gross cost including labour, depreciation of stock repairs, etc., is estimated at Rs. 10 per acre. This is estimated on the information supplied by malguzars who irrigate from wells (see my Notes on irrigation in the Saugor, Damoh, Hoshangabad and Nimar districts). This must be deducted from the above figures.

36.—The figures given in answer E 35 (3) represent approximately the increase in the total annual value of the produce per acre due to well irrigation. A little may be added for additional food crops that may be taken from the land and the more profitable cultivation of sugarcane instead of wheat on some of the area. The following are approximate figures:—

	Rs.
(1) On an average of a normal term of years	22
(2) In a year of drought	28

From these figures Rs. 10 per acre should be deducted for the expense of irrigation.

37.—(1) & (2) Wells are private property and only sufficient to irrigate the owner's lands. Water is not to my knowledge sold from them.

38.—(1) Difficulties are often experienced in selecting a spot for a well in which a good supply of water will be obtained. At the irrigation meeting held at Nimar, the malguzars gave instances of considerable loss sustained by cultivators in digging wells and failing to get water.

(2) The difficulties experienced in the actual construction of wells do not seem to be considered serious; but I know that they do retard well construction considerably. In the Phuljhar and Borasambar Zamindaris of Sambalpur, the Deputy Commissioner, Mr. R. B. Chapman, i.c.s., took considerable trouble to get the people to construct sanitary wells in the villages. Though they took kindly to the idea, and the Manager exerted himself to the utmost to secure good progress, little headway was made till the people were assisted. Two or three brick-makers were sent round who showed the people how to make their bricks and lime, and do the excavation. As soon as the materials were collected, and the excavation finished, a couple of brick-layers arrived and helped the villagers to complete the masonry. A good number of wells were then finished annually.

Professional assistance has been provided by Local Bodies on the construction of sanitary wells; but I am not aware of any assistance having been provided for the construction of irrigation wells.

I would recommend that a small staff of borers, and some boring tools, be kept in each district where there is a possibility of appreciably extending well irrigation, to help cultivators to select, and test sites for wells. The cultivators making use of them, might

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arrange for the carting of the tools to and from the sites, and pay for the borers for the days they are actually employed on their work. The malguzars in the northern districts are of opinion that such assistance will be gladly accepted.

For the construction of irrigation wells, the cultivators can be assisted in the way Mr. Chapman helped the villagers to make sanitary wells in the Borasambar and Phuljhar Zamindaris. As soon as a number of cultivators in a circle arrange to construct irrigation wells and ask for assistance, the party of brick-makers and masons can be organised and sent round at the proper time to help in their construction.

39.—I am not in favour of the construction of irrigation wells by Government at all, unless it can be shown that such a course is absolutely necessary. The State can never construct these wells as economically as the cultivators can. They can economise in numerous ways that the State cannot.

I would only recommend the construction of wells by the State in land which is private property, under the following conditions:—

- (a) At the special request of the owner of the land.
- (b) On the security of the land.
- (c) On the condition that the owner of the land pays 4 per cent. per annum on the cost of constructing the well.
- (d) That he be responsible for keeping the well in proper repair at his own expense.
- (e) That he work the well himself at his own expense.
- (f) That he have the right to purchase the well at any time in whole, or by instalments. If the latter system be adopted, that the amount of the annual interest paid by him be reduced proportionately to the extent of the capital paid up.

40.—Temporary wells are largely used in the Central Provinces. There were the following number in use for irrigation in the years mentioned below:—

	No.
Normal years 1894-95 . . .	38,426
Year of drought 1899-1900 . . .	46,254

The average area irrigated per well in the Province in 1899-1900 was only 0.77 of an acre, and as there were 13,286 durable wells in operation in it, and the latter irrigate larger areas than the temporary wells do, the average area irrigated by each temporary well must have been still less, and could not have been over 0.7 of an acre. All the temporary wells in the Province could not therefore have irrigated more than 32,378 acres in that year. There can be little doubt that the most favourable sites were selected for the construction of the wells that were used in 1899. The results therefore show how little protection they afford against drought.

In rice areas even a good permanent well is of little use to irrigate the crop in a year of drought, and a temporary one is of less use still. But a break of 15 days in July, August or September, and even in October, does great damage to the crop, if it does not indeed ruin it. It is impossible to tell, till it is too late, that a year is going to be one of drought. So that by the time the necessity for the construction of temporary wells will be established beyond doubt, the crops will begin to suffer for want of water. And by the time the arrangements are made, and the wells constructed to water them, the crops will be beyond redemption in a year of drought. For rice areas, therefore, I consider temporary wells useless as a protection against drought.

In wheat areas more time is available to get such wells constructed, as being on black cotton soil, that crop suffers little from drought. But then in such years, the black cotton soil cracks badly, and a temporary well will fall in as soon as it is made. These wells are therefore of little use for wheat on such soil.

Under these circumstances, I am of opinion that temporary wells are useless as a protection against drought.

F.—BUNDED FIELDS.

41.—This is a system of irrigation practised in the Central Provinces on the flat black cotton soil areas cropped with wheat. It is not included in the list of questions; but as it is a very economical system of irrigation, and one much favoured in these Provinces,

it deserves special consideration, and I am adding information connected with it on the lines of the questions set for wells.

The system of irrigation exist at present in—

- (i) The Jubbulpore and Narsinghpur districts where the areas to which it is applied are called the "Haveli areas."
- (ii) The Powni-Chouras in the south of Bhandara, and to a small extent in other parts of that district.
- (iii) In Balaghat District.
- (iv) It is being extended now in the Saugor, Damoh, Hoshangabad and other districts.

The system consists in constructing embankments 4 to 5 feet high around fields, and storing up the rainfall in them till the beginning of October. The fields are then drained, and as soon as the soil is fit for ploughing, this is done and wheat sown. In some of these fields a catch-crop of early rice is taken during the rains.

Since writing my Note on Irrigation in the Central Provinces, I have had the opportunity of examining this system of irrigation more closely, and of discussing it with the malguzars and district officers of the Northern districts. It seems to be the most economical and most favoured system for improving and protecting wheat areas on black cotton soil.

It can effectively eradicate "Kans" grass in one year, which no other system of irrigation can do at all. One year's good flooding kills this terror to the cultivator of such lands, and in this lies the great advantage of this system of irrigation over others.

Its only disadvantage is that rust attacks the crops in banded fields more than it does in unbanded ones. But the cultivators state that the advantages gained are so great, that they do not mind this defect. Moreover, rust is caused by heavy rain and continued cloudy weather in winter, and not by drought.

Further particulars are contained in my Notes on the Saugor, Damoh and Hoshangabad districts.

42.—(1) The height of the embankments depends on the slope of the land.

The average may be taken between 4 and 5 feet.

The minimum economical size for the fields is said by the malguzars to be 5 acres. Smaller fields they say cost more.

(2) The supply of water impounded in the fields is entirely due to the off-flow from the rainfall.

(3) The cost of construction depends on the slope of the ground. The greater the slope the higher the embankments have to be. The average cost is estimated between Rs. 10 in Hoshangabad and Rs. 25 in Saugor.

Nathu Ram, malguzar, of the Saugor District, who has banded large areas in his villages in the Khurai Tahsil, states that it cost him Rs. 25 per acre. I examined some of his embankments near Bina Railway Station, and noticed that a great deal of expense might have been saved if he had been helped with levels.

Khasi Nath Tewari, a malguzar in the Hoshangabad District, who has had a good deal of experience in bunding fields, stated that it cost him Rs. 10 per acre.

The average cost may therefore be roughly estimated at Rs. 20 per acre.

43.—(1) It allows the cultivator to take a catch-crop of early rice during the monsoon before the wheat is sown. The net return from this crop to the cultivator is about Rs. 12 per acre.

(2) In wheat the value of the produce can be very little increased by the cultivation of the better varieties.

(3) The malguzars estimate that while 120 lbs. of seed are required per acre in ordinary fields, about 90 lbs. are sufficient in banded fields.

Also that the yield from wheat sown in embanked fields is from $1\frac{1}{2}$ to $1\frac{3}{4}$ of what it is in ordinary unembanked and unirrigated fields.

The average yield from wheat in unembanked and unirrigated fields in Nimar and Hoshangabad is 600 lbs. Taking the lower of the above figures, the embanking of the fields adds 300 lbs. per acre to the yield.

The profit from an acre of unirrigated wheat on an unbanded field is estimated [see answer D 24 (3)] at Rs. 15 per acre.

At 300 lbs. per acre, the increase in the profit due to bunding the field at 12 seers to the rupee=Rs. 12-8-0, or say Rs. 12.

Taking a full crop at 16 annas, the cultivators reap on an average the following wheat crops, as these are less affected by drought :—

	As.	Per cent
Year of ample rainfall . . .	=14	88
Year of scanty rainfall . . .	=12	75
Year of drought . . .	= 8	50

The catch-crop of rice will, however, drop to eight annas in years of scanty rainfall, and about four annas in years of drought.

The increased value of the yield from wheat land due to bunding it may therefore be estimated as follows :—

Years.	Saving on unirrigated yield.	Amount due to the increased yield from irrigation.	Value of second crop due to bunding.	Total.
	Rs.	Rs.	Rs.	Rs.
(a) Year of ample rainfall.	2	12	12	26
(b) Year of scanty rainfall.	4	12	6	22
(c) Year of drought .	8	12	3	23

The catch-crop of rice is not, however, taken off all the bunded wheat lands.

As the water stored is entirely rainfall, the irrigation costs nothing. A little labour is needed to drain the field by cutting the embankment and to fill up the breach each year. But this is more than compensated for by the saving in seed and the improvement of the soil. The latter is left in such a fine mould after the field is drained, that labour and cattle can work twice the area they can on unbunded fields.

44.—(1) & (2). The wheat crop is not affected much by either the too late commencement or too early cessation of the rainfall. The water is kept impounded in the fields till October, and this keeps the ground sufficiently moist for the crop to mature.

The rice crop, however, suffers a little; but as it is early rice, an 8-anna crop can generally be secured even in years of drought. *Mr. G. M. Harriott.*

45.—No supplementary irrigation is given nor is any necessary. *4. Mar. 02.*

46.—The following is an approximate estimate of the increase in the total annual value of the produce per acre due to irrigation :—

Periods.	Increase from double-cropping due to irrigation.	Increase due to additional yield due to irrigation.	Total.
	Rs.	Rs.	Rs.
(1) On an average normal term of years.	9	15	24
(2) In a year of drought .	3	20	23

The above figures are the net returns due to irrigation alone; for the irrigation costs practically nothing, and what little it costs is made up by other advantages.

47.—The malguzars both in Saugor and Hoshangabad stated that they experienced no difficulty in separating the holdings.

48.—I am of opinion that the State might undertake the embanking of wheat fields in black cotton soil with advantage, where cultivators admit the advantages of embanking, and would like their fields embanked, but cannot be induced to risk the initial expense.

But I would only recommend this where efforts to get the people to construct these embankments fail.

The State can help the cultivators very considerably to economise in constructing their embankments by having levels taken for them, so that they can be run along contours. It can also assist them to rearrange holdings where the embankments cut them up at all. It can further help them with professional advice regarding the provision of sufficiently large waste channels in large embankments. Near Bina Station the crop of one field was ruined this year by the embankment being breached by floods and the water being drained off too early.



सत्यमेव जयते

ABSTRACT STATEMENT

OF THE

AVERAGE RAINFALL IN THE CENTRAL PROVINCES.

MONSOON RAINFALL.

ABSTRACT OF RESULTS.

Serial No.	Results.	Rainfall in inches.	Ratio.
1	Mean rainfall (33 years)	44.18	1.00
2	The wettest year (1884-85)	58.33	1.32
3	The driest year (1868-69)	23.31	0.53
4	The two consecutive wettest years (1891-92 and 1892-93)	53.85	1.22
5	The two consecutive driest years (1868-69 and 1869-70)	31.93	0.72
6	The three consecutive wettest years (1891-92, 1892-93 and 1893-94)	52.27	1.18
7	The three consecutive driest years (1868-69, 1869-70 and 1870-71)	35.65	0.81
8	The greatest number of consecutive years each of which is above or below the mean— (a) Above the mean (6 years—1889-90, 1890-91, 1891-92, 1892-93, 1893-94 and 1894-95) (b) Below the mean (4 years—1868-69, 1869-70, 1870-71 and 1871-72)	51.16 35.52	1.16 0.80
9	Percentage of number of years with average— (a) Above the mean (18 years) (b) Below the mean (15 years) ... ..	... ...	Percentage. 54.54 45.46

ABSTRACT STATEMENT OF THE AVERAGE

Years.	5 WET MONTHS.										Total for 5 wet months.
	JUNE.		JULY.		AUGUST.		SEPTEMBER.		OCTOBER.		
	Total rain-fall.	Maximum daily fall.	Total rain-fall.	Maximum daily fall.	Total rain-fall.	Maximum daily fall.	Total rain-fall.	Maximum daily fall.	Total rain-fall.	Maximum daily fall.	
1	2	3	4	5	6	7	8	9	10	11	12
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1867-68	9.09	7.50	13.58	7.20	15.05	9.12	8.06	8.50	1.48	5.50	47.26
1868-69	5.44	4.49	10.05	7.12	4.24	5.44	3.87	7.80	0.01	0.20	23.31
1869-70	3.88	3.42	13.74	9.10	9.78	5.30	9.06	5.80	4.10	6.52	40.56
1870-71	9.29	10.30	15.58	7.65	8.49	8.50	6.15	5.40	3.58	6.90	43.09
1871-72	5.65	6.50	13.94	7.75	5.77	6.40	9.73	7.50	0.05	1.30	35.14
1872-73	7.07	6.20	16.62	11.90	13.66	9.50	7.95	5.80	1.03	3.30	46.33
1873-74	2.85	4.30	13.48	8.10	9.76	6.10	11.10	9.41	0.11	1.50	37.25
1874-75	10.64	7.80	16.07	10.20	13.25	10.20	6.01	4.40	0.68	2.70	46.65
1875-76	9.11	14.70	20.39	11.20	10.87	9.10	8.73	7.70	1.78	5.45	50.88
1876-77	3.45	3.80	16.77	13.10	11.05	6.90	10.75	14.61	0.45	4.55	42.47
1877-78	7.78	12.49	10.23	9.32	11.30	9.23	4.00	5.40	2.45	5.00	35.76
1878-79	3.55	6.00	14.64	13.00	16.10	8.00	7.46	6.03	1.57	3.78	43.22
1879-80	8.09	10.30	9.82	6.53	13.05	6.80	6.74	4.02	2.89	3.21	45.59
1880-81	8.17	8.00	13.71	7.93	8.58	9.63	10.88	6.50	2.57	2.49	43.91
1881-82	9.95	6.15	16.76	7.92	13.26	9.20	6.14	5.49	1.58	5.50	47.69
1882-83	11.53	11.30	20.71	9.50	7.51	9.65	6.92	7.63	0.37	2.14	47.04
1883-84	10.74	9.00	14.40	8.20	8.13	7.30	11.94	15.30	2.56	5.10	47.77
1884-85	7.76	11.00	20.45	8.62	13.89	6.66	15.28	6.94	0.95	3.00	58.33
1885-86	10.69	8.00	15.62	9.90	10.29	9.00	3.32	9.00	2.07	5.33	41.89
1886-87	7.35	4.20	14.98	11.33	6.65	9.17	3.20	3.74	5.40	3.51	37.58
1887-88	8.03	8.11	21.14	11.71	15.12	8.10	7.43	4.75	4.09	8.05	55.81
1888-89	5.31	5.25	14.94	8.12	14.91	12.10	5.90	9.29	0.28	2.30	41.34
1889-90	8.10	9.30	13.09	11.17	17.43	10.50	5.26	8.15	3.13	4.70	47.41
1890-91	8.53	9.27	16.72	7.94	12.53	9.46	10.19	11.30	0.45	1.26	48.42
1891-92	1.78	6.51	18.15	8.75	13.07	8.10	23.70	16.62	0.93	5.01	57.63
1892-93	5.70	6.59	18.52	10.80	13.69	6.03	9.49	8.40	2.68	3.46	50.08
1893-94	10.22	8.40	10.24	6.03	14.98	7.50	10.48	5.35	3.17	5.60	49.09
1894-95	9.46	7.96	17.33	10.50	11.52	8.87	11.28	10.20	4.76	4.40	54.85
1895-96	3.09	8.02	10.65	8.14	13.25	8.00	3.44	2.83	0.74	2.45	31.17
1896-97	10.87	10.60	16.90	8.94	19.06	9.90	1.31	4.75	...	1.59	48.14
1897-98	4.36	5.45	12.22	8.00	16.30	13.04	7.84	7.70	1.83	3.35	42.55
1898-99	7.54	6.93	18.05	9.94	13.64	7.35	6.63	5.63	0.42	4.54	46.28
1899-1900	5.29	4.05	7.85	7.40	8.36	6.42	2.64	4.36	0.02	0.50	23.86
Mean monthly fall.	7.29	...	15.07	...	12.11	...	7.95	...	1.76	...	44.18
Maximum monthly and daily fall.	11.53	14.70	21.14	13.10	19.06	13.04	23.70	16.62	5.40	8.05	58.35
Minimum monthly fall.	1.78	...	7.85	...	4.24	...	1.31	...	0.01	...	23.31

I.

RAINFALL IN THE CENTRAL PROVINCES.

7 DRY MONTHS.							Total for 7 dry months.	Total rainfall during the year.	Maximum daily fall during the year.	REMARKS.
Novem-ber.	Decem-ber.	January.	February.	March.	April.	May.				
13	14	15	16	17	18	19	20	21	22	23
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	
0.11	0.02	1.13	0.13	0.33	0.01	0.25	1.98	49.24	9.22	Driest year.
...	0.02	0.09	0.08	0.69	0.08	0.38	0.34	24.65	7.80	
0.01	0.51	1.24	0.05	1.09	0.30	0.05	3.25	43.81	9.10	
0.46	0.01	0.75	0.31	0.04	0.05	0.83	2.45	45.54	10.30	
0.11	0.03	0.07	0.04	0.32	0.66	0.07	1.30	36.44	7.75	
0.07	0.47	0.16	0.33	0.37	0.02	0.59	2.01	48.34	11.90	
0.03	0.14	0.43	0.19	0.17	0.01	0.33	1.30	38.55	9.41	
0.04	0.02	0.21	0.46	0.03	0.05	0.36	1.14	47.79	10.20	
0.01	0.13	...	...	0.18	0.03	0.31	0.66	51.54	14.70
...	...	2.88	0.79	0.55	0.60	1.51	7.33	49.80	14.61	
0.18	1.27	0.49	0.85	0.24	1.00	1.36	5.39	41.15	12.49	
0.28	0.13	...	0.46	0.04	...	1.63	2.54	45.86	13.00	
0.15	...	...	0.12	0.01	0.02	0.15	0.45	46.04	10.30
1.02	1.01	0.02	0.07	1.92	0.03	0.35	3.42	47.33	9.63	
0.55	0.03	0.07	0.05	0.01	0.33	0.36	1.40	49.09	9.20	
1.96	0.13	0.46	0.01	0.45	0.01	0.51	3.53	50.57	11.30	Wettest year.
0.27	0.06	0.52	0.44	0.05	0.04	0.17	1.55	49.32	15.30	
...	0.87	0.44	0.50	0.56	0.48	1.49	4.34	62.67	11.00	
0.43	4.22	0.25	0.09	0.33	0.01	0.92	6.30	48.29	9.90	
0.29	0.82	1.02	...	0.01	0.21	0.20	2.55	40.43	11.33	
1.74	0.26	1.21	0.40	0.23	0.04	0.14	3.02	58.83	11.71	
1.04	0.01	0.04	0.21	0.16	0.63	0.36	2.45	43.79	12.10	
0.09	...	...	0.01	0.60	0.46	0.05	1.21	48.62	11.17
1.35	0.55	0.44	0.75	1.19	0.47	0.47	5.22	53.64	11.30	
0.02	...	0.18	0.51	0.04	0.09	0.13	0.97	58.60	16.62	
0.29	0.03	2.17	0.93	2.97	0.17	1.40	7.96	58.04	10.30	
2.02	0.01	0.24	0.54	0.26	0.18	0.09	3.34	52.43	8.40	
1.12	1.35	0.18	0.94	0.84	0.72	0.16	4.31	58.66	10.50	
0.08	0.04	...	...	0.06	0.03	0.19	0.40	31.57	6.14
0.87	1.52	1.06	0.53	0.26	0.76	0.35	4.35	52.49	10.00	
0.02	...	...	1.93	0.01	0.23	0.20	2.39	44.94	13.04
0.01	0.10	0.01	0.37	0.03	0.75	0.64	1.91	48.19	9.94	
...	...	0.89	0.33	0.09	0.47	0.80	2.08	25.94	7.40	
0.41	0.32	0.51	0.38	0.43	0.30	0.49	2.84	47.02	...	Average of 33 years.
2.02	4.22	2.88	1.93	2.97	1.60	1.63	7.96	62.67	15.30	Maximum yearly and daily fall.
0.01	0.01	0.02	0.01	0.01	0.01	0.05	0.40	24.65	...	Minimum yearly fall.



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ANNUAL RAINFALL.

ABSTRACT OF RESULTS.

Serial No.	Results.	Rainfall in inches.	Ratio.
1	Mean rainfall (33 years)	47.02	1.00
2	The wettest year (1884-85)	62.67	1.33
3	The driest year (1868-69)	24.65	0.52
4	The two consecutive wettest years (1883-84 and 1884-85)	55.99	1.19
5	The two consecutive driest years (1868-69 and 1869-70)	34.23	0.73
6	The three consecutive wettest years (1890-91, 1891-92 and 1892-93)	56.76	1.21
7	The three consecutive driest years (1868-69, 1869-70 and 1870-71)	38.00	0.81
8	The greatest number of consecutive years each of which is above or below the mean— (a) Above the mean (6 years—1889-90, 1890-91, 1891-92, 1892-93, 1893-94 and 1894-95) (b) Below the mean (4 years—1868-69, 1869-70, 1870-71 and 1871-72)	54.99 37.61	1.17 1.80
9	Percentage of number of years with average— (a) Above the mean (20 years) (b) Below the mean (13 years) . . . . .	... ...	Percentage. 60.61 39.39

DISTRIBUTION OF RAINFALL.

MONTHS.	RAINFALL.			REMARKS.
	Average.	Maximum.	Minimum.	
June	7.29	11.53	1.78	Maximum daily fall 14.70
July	15.07	21.14	7.85	Do. 18.10
August	12.11	19.06	4.24	Do. 13.04
September	7.95	23.70	1.81	Do. 16.62
October	1.76	5.40	0.01	Do 8.05
November	0.41	2.02	0.01	
December	0.32	4.22	0.01	
January	0.51	2.88	0.02	
February	0.38	1.93	0.01	
March	0.43	2.97	0.01	
April	0.30	1.60	0.01	
May	0.49	1.63	0.05	

TABLE

Showing the Average, Maximum and Minimum Rainfall for each month in the year for

Districts.	JUNE.			JULY.			AUGUST.			SEPTEMBER.			OCTOBER.		
	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Jubbulpore	7.38	18.09	1.22	17.59	33.10	4.86	14.33	28.51	1.62	6.79	22.38	0.62	1.60	6.02	0.04
Seoni	8.79	18.09	2.91	16.48	30.10	7.39	11.82	21.45	3.67	8.58	33.02	1.10	1.88	6.60	0.08
Mandla	7.20	17.94	1.22	17.17	29.51	6.80	14.43	26.38	3.20	7.72	21.40	1.50	1.39	7.29	0.05
Saugor	7.30	17.58	1.26	15.31	34.52	6.18	11.97	26.86	2.35	7.01	26.35	0.58	1.29	5.55	0.02
Damoh	6.26	18.71	0.93	15.21	34.07	5.29	13.79	25.98	0.70	7.58	30.21	1.12	1.60	6.97	0.04
Nagpur	7.59	16.09	0.38	13.51	19.34	2.57	10.26	19.80	2.96	8.24	21.42	1.16	2.33	7.65	0.01
Wardha	6.05	12.63	1.36	12.65	25.09	0.84	8.39	19.73	1.40	7.17	20.93	0.44	2.23	8.63	0.06
Chanda	7.13	14.56	2.07	15.78	24.56	1.66	11.86	23.94	2.65	8.60	19.88	1.70	2.07	6.32	0.03
Bhandara	8.65	18.12	0.71	16.82	27.63	3.16	14.41	33.07	1.99	8.83	23.45	1.34	1.50	4.65	0.04
Balaghat	8.81	20.83	1.93	19.30	34.73	3.63	16.00	30.89	1.13	8.27	19.81	0.94	1.74	6.63	0.03
Hoshangabad	6.85	15.18	0.81	14.37	24.30	2.98	12.89	30.44	1.87	9.46	21.72	0.13	1.36	7.40	0.04
Betul	6.69	14.91	0.76	12.43	26.83	4.39	9.61	17.89	2.29	6.46	22.58	0.02	1.39	7.29	0.02
Nimar	6.03	13.62	1.40	9.12	18.83	1.94	7.37	17.61	2.82	6.64	17.50	0.36	1.39	7.76	0.01
Narsinghpur	8.63	22.80	0.90	17.03	35.38	8.55	13.71	26.43	4.76	9.66	55.20	1.05	1.67	8.05	0.04
Chhindwara	7.00	16.85	1.36	11.23	22.49	5.26	7.46	15.63	2.33	7.64	21.20	0.29	2.01	7.97	0.01
Raipur	8.52	25.76	2.42	14.80	28.44	5.28	11.82	20.35	3.01	7.12	15.92	2.44	1.63	4.55	0.01
Bilaspur	8.23	17.23	1.11	14.51	26.16	6.13	12.58	21.23	4.85	7.48	16.97	1.71	1.62	6.48	0.02
Sambalpur	9.50	22.29	1.46	18.04	39.81	6.49	14.17	23.88	5.93	7.38	18.16	1.46	1.88	6.12	0.03

II.

each District in the Central Provinces, deduced from the records of 33 years 1867 to 1899.

NOVEMBER.			DECEMBER.			JANUARY.			FEBRUARY.			MARCH.			APRIL.			MAY.		
Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
0.27	1.93	0.01	0.23	4.13	0.01	0.71	3.49	0.03	0.46	3.30	0.03	0.35	2.16	0.01	0.22	2.19	0.01	0.44	3.29	0.01
0.53	3.04	0.05	0.45	6.41	0.02	0.75	4.87	0.02	0.69	3.71	0.02	0.67	3.06	0.01	0.41	3.24	0.01	0.63	2.80	0.01
0.36	2.42	0.02	0.18	1.61	0.02	0.52	3.51	0.01	0.64	4.26	0.06	0.72	4.23	0.04	0.30	2.90	0.03	0.29	1.56	0.01
0.22	2.22	0.01	0.52	7.23	0.05	0.54	2.14	0.01	0.31	1.89	0.01	0.21	1.87	0.01	0.13	0.85	0.01	0.30	1.91	0.01
0.19	1.93	0.03	0.41	7.24	0.01	0.46	2.17	0.03	0.33	1.72	0.04	0.19	1.47	0.01	0.10	0.67	0.04	0.24	1.17	0.03
0.60	5.54	0.01	0.32	3.91	0.01	0.57	4.24	0.02	0.41	2.33	0.02	0.47	3.67	0.01	0.40	2.42	0.01	0.39	2.28	0.01
0.59	3.68	0.12	0.33	4.03	0.04	0.39	2.09	0.01	0.29	1.33	0.01	0.38	5.93	0.02	0.26	1.56	0.01	0.50	4.77	0.01
0.70	2.81	0.01	0.29	2.30	0.04	0.33	1.60	0.01	0.29	3.32	0.01	0.37	11.89	0.01	0.52	2.86	0.01	0.70	3.28	0.01
0.50	4.94	0.01	0.27	4.68	0.01	0.52	4.84	0.06	0.39	3.47	0.02	0.49	3.63	0.01	0.38	2.07	0.02	0.41	2.39	0.03
0.40	2.70	0.03	0.23	3.21	0.02	0.48	2.97	0.02	0.50	3.03	0.01	0.37	2.02	0.01	0.31	2.27	0.07	0.56	2.31	0.01
0.25	3.07	0.03	0.44	6.41	0.01	0.31	2.03	0.01	0.17	1.24	0.01	0.12	1.22	0.01	0.06	0.35	0.01	0.32	4.42	0.02
0.36	2.77	0.03	0.49	7.05	0.01	0.67	4.65	0.01	0.21	0.32	0.02	0.35	3.16	0.04	0.18	0.99	0.01	0.35	1.82	0.01
0.21	1.67	0.03	0.35	2.56	0.03	0.28	2.55	0.01	0.18	2.34	0.04	0.08	0.84	0.02	0.09	0.55	0.01	0.32	2.01	0.01
0.24	2.17	0.01	0.36	4.89	0.02	0.51	2.45	0.02	0.33	1.51	0.03	0.27	1.92	0.02	0.18	1.30	0.01	0.28	1.99	0.01
0.46	2.61	0.02	0.36	4.91	0.22	0.63	7.10	0.06	0.42	1.88	0.01	0.45	3.29	0.01	0.31	2.04	0.01	0.41	2.75	0.01
0.42	1.90	0.07	0.18	1.99	0.01	0.27	2.33	0.01	0.33	1.81	0.03	0.44	2.14	0.01	0.50	2.69	0.02	0.75	2.84	0.02
0.58	2.62	0.04	0.20	1.60	0.01	0.53	2.47	0.02	0.43	2.57	0.02	0.59	3.40	0.02	0.56	4.44	0.07	0.79	5.65	0.04
0.46	2.28	0.01	0.21	1.75	0.02	0.56	5.00	0.03	0.37	2.09	0.03	0.73	5.49	0.02	0.42	2.49	0.03	1.13	4.43	0.03

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1. Q. (The President.)—You have had a number of years' experience, Mr. Harriott, in this province?—Yes, I have been here nearly 22 years.

2. Q. You were here throughout the famines?—I was not here in the second famine, but I was here in the famine of 1896-97.

3. Q. What districts were you in?—In Raipur and Chhattisgarh.

4. Q. They suffered very much?—Yes, very severely.

5. Q. You are in charge of works of all kinds, both roads and irrigation?—Roads and buildings. In the Feudatory States there were also several minor tanks which I had to construct.

6. Q. I understand that there is not a single Government tank in these provinces?—There is no Government tank for irrigation. There is only one which is worked in a semi-Government way, by the District Council of Nimar. That is the Lachora tank.

7. Q. That is apparently a small one. It has got only a small area under irrigation?—Yes, owing to a leak the supply has gone down very considerably. In the year 1896 there was very little water in it.

8. Q. You say, in reply to paragraph 4 of question 3, speaking of the unsuitability of the soil, that the year 1894-95 was considered a good average agricultural year, and that in that year there were about 4,533,400 acres of rice lands under crop, of which 531,907 acres were irrigated. You say "the following areas were under the crops mentioned, and irrigation could without doubt have been applied to the whole of these lands." Were there any means of irrigating them?—No; these lands could have been irrigated.

9. Q. If there had been means, they would have taken water?—Yes. Irrigation was applicable to them.

10. Q. Then you go on to say, "Besides these lands, there were 2,533,992 acres under wheat, of which at least half is unembanked land, and it seems that this might have been irrigated; but practically none was irrigated. The question as to whether such lands can be irrigated is, however, disputed." What is disputed?—The irrigation of wheat on black cotton soil is the disputed question.

11. Q. (Mr. Muir-Mackenzie.)—Is it disputed how far embanking would be suitable for that soil?—I do not think there is much dispute about that. In the Jubbulpore District there is a very large area called *haveli* which is embanked and in which Revenue Officers state no irrigation whatever is needed.

12. Q. (The President.)—That is very important. At the bottom of page 3 you talk about irrigation meetings. What were these meetings?—In order to get the opinions as to what lands irrigation should be applied and to what crops we could apply irrigation, the Deputy Commissioners and the Commissioner of the Division were asked to hold meetings in the various districts. We got as many malguzars together as we could, and I questioned them on these points and noted their answers in my notes on different districts.

13. Q. Were the District Officers present?—Yes, and several malguzars.

14. Q. Were reports made of the proceedings?—I made notes of the proceedings and sent a copy of them to District Officers.

15. Q. In reply to paragraph 4 of question 3, you say, "I have no doubt that wheat grown on unembanked black cotton soil can be successfully and advantageously irrigated even in normal years." You refer also to one or two instances in your replies regarding the irrigation of wheat on black cotton soil. Am I right in supposing that the part of the Central Provinces which is most concerned in this question is the valley of the Nerbudda?—Yes, the Nerbudda valley and the plateau to the north of that valley. The districts of Saugor and Damoh drain north-east into the Jumna valley.

16. Q. Supposing there was no question of black cotton soil, is the Nerbudda valley in other respects, by the lie of the valley, a suitable one for irrigation or must irrigation be tied down to a narrow deep valley?—We are tied to a narrow deep valley; but the question, I do not think, has been seriously considered, as to whether anything in the way of an extensive irrigation scheme could be constructed in the Nerbudda valley. This question of black cotton soil has prevented any large project from being taken up in that valley. If it be carefully inspected and the question gone into, we may find that some scheme is possible.

17. Q. Have cross-sections of the valley been taken?—No.

18. Q. Have you got any discharges of the Nerbudda?—No.

19. Q. Could we have one taken now? I want to know what the Nerbudda is carrying about March. Have you got any officer there to whom you could telegraph?—I have an Assistant Engineer there doing surveys in Jubbulpore. I could depute him to take the discharges.

20. Q. Have you any idea what the Nerbudda is carrying? Would it be about 1,000 cusecs?—I would not like to offer any opinion, but I should not be surprised if it is carrying about that. This is a dry year and we have had no rain since September, and it is just possible that the supply may be as low as it ever is.

21. Q. (Mr. Higham.)—Has the minimum supply ever been gauged?—No.

22. Q. That might be done, this being a low year?—Yes, I can telegraph to Mr. Todd, the Assistant Engineer, and get him to take it.

23. Q. (The President.)—You say that from the lie of the valley *prima facie* it does not lend itself to irrigation?—The run of a canal from the Nerbudda would be between the Vindhian plateau on the north and the Satpura range on the south, running through Jubbulpore, Narsinghpur, Hoshangabad and Nimar. It is a very narrow valley much broken by drainage, and where the canal would cross it is not suitable for storage but it might be possible to store on the tributary streams.

24. Q. At the top of page 6 in your reply to question 3, 9 (d), talking about *takavi* rules, you say that the cultivators do not seem to be well acquainted with the rules?—I do not think they know the rules well from what I have ascertained at these meetings.

25. Q. They do not know how favourable they are?—Yes.

26. Q. In reply to question 5 (c) you say, "the amounts of such loans are limited to three times the rental of the holdings." Is that a local rule of the Central Provinces?—I cannot tell you whether it is a local rule or not. Mr. Sly will be able to tell you that. It is with reference to small holdings that I have said this. If a poor man is a good cultivator and is anxious to improve his land by irrigation, he must find security to get a sufficient loan. And he sometimes finds it difficult to get this.

27. Q. I suppose loans would be given generally for wells?—They might be given for tanks; and in parts of Chhattisgarh, also for embanked fields (*bhandhans* and *ghatas*).

28. Q. In reply to paragraph 1 of question 5 you say that "judging from the view taken of the subject by the majority of the malguzars, I think that a reduction of the rate of interest to 3 per cent. per annum should secure the object in view." You think that they are deterred by the high rate of interest?—The evidence here points in that direction. In Nimar malguzars had no complaint to make about the interest. In Saugor they suggested a reduction; and in Hoshangabad they were divided on the subject. I should say generally that malguzars themselves do not consider the 6 per cent. charge too high, though they think that a reduction might favour the increase of works, especially where the poorer people were concerned.

29. Q. I notice that you say in reply to paragraph 3 of question 5, in talking about partial remissions and advances, "that the supervision be exercised by the State if possible through a malguzar." Do you mean to say through men of influence?—A malguzar is a man who practically owns the village: he is the proprietor. I would suggest a malguzar or a panchayat of malguzars. We might divide the districts into circles, and get the more reliable malguzars to form themselves into panchayats to deal with applications for and the supervision of each loan.

30. Q. Can you suggest any means by which the system of bunding fields can be encouraged?—I think that if the country is not level we can help them with levels in the alignment of their bunds.

31. Q. As I gather, this system of bunded fields is not generally throughout the Central Provinces; it is in vogue more on the Jubbulpore side of the country?—It exists also in the south of Bhandara in the Paoni Chauras, which is rice country.

32. Q. Do all the cultivators know about it?—Most of the cultivators in the northern part of the province know about it. It is generally known to cultivators throughout the province.

33. Q. If the cultivators had the means given to them they would probably avail themselves of it?—I think so. It is being newly introduced in Hoshangabad and Saugor.

34. Q. It is spreading?—It was adopted to a small extent in Saugor, but it is spreading. In Hoshangabad a good deal has been done since the last famine. There is a large area under bunds in Jubbulpore and also in Damoh.

35. Q. I am not going to ask you many questions just now, because, as long as we are in the Central Provinces, I hope you will be helping us. I wish to ask you generally one thing. What line of action would you advise Government to take to protect this province so that it may be better able to withstand another famine?—I would construct as many irrigation works as possible. I should confine famine labour to irrigation works.

36. Q. Famine labour will be available when famine comes, but what shall we do to protect the country against famine?—The introduction of irrigation is the only thing that will protect it. My opinion I have given in one or two paragraphs in my memorandum.* People used to have a large stock of grain. I remember in my time, in the year 1886 or 1887, in Sambalpur where there was a partial failure, when I was giving orders to open one or two test works, I found that although people lost crops that year, yet they had two years' supply stored in each village. But these stocks are now going away. The railway in carrying them away. Poorer people spend all the money they get, and then come to our works in case of a failure. The only way to protect ourselves against famine is by protecting the crops.

37. Q. Have you paid much attention to the subject of wells?—I had some well-construction in Kowdia and Borasambar. Mr. Chapman was the Deputy Commissioner then. But this well-construction was done more for sanitary purposes.

38. Q. For the water-supply of the village?—Yes.

39. Q. Do you think that they are capable of being very largely increased in number?—I think they are.

40. Q. Would you advise such an increase?—I would, especially in the wheat tracts. I do not think that wells are much used in the rice country. In wheat country, I think, they can be largely extended and they will do a great deal of good.

41. Q. (Mr. Higham.)—In all your schemes of irrigation, it is the month of October that you find it necessary to make provision for?—September and October; September is also a very important month.

42. Q. These are the two months in which artificial assistance is ordinarily required?—Yes.

43. Q. And in other months of the year the rainfall is almost invariably sufficient?—It is generally sufficient. But it is occasionally unseasonable. For instance, this year we had two big breaks—one from the beginning of July to the 17th of July and the other from the 1st to the 15th September.

44. Q. It is quite possible that in the month of July, before the rains have set in strongly, you might require to give water to people who want it?—Yes, especially in transplanted rice districts.

45. Q. That is, in order to provide them with water, you must have stored it in previous years?—Yes, you must bring forward the storage from previous years.

46. Q. Can you explain how you fix the area that is to be protected by each proposed work?—We take the worst of a series of years for which we have got rainfall statistics which have been abstracted for 1867 to 1899. We take the worst of this series of 33 years and we go back to the last year in that series in which the tank would have filled, supposing it to have been in existence, and then work down to the minimum year, to the year of drought, to see what area it could have protected right through, and that area we take as the area the tank could protect.

47. Q. Can you show me one of the forms for any of your works?—I do not think I have got one of them here. I will show one to you presently.

48. Q. Having ascertained the total area that the tank will protect will you tell us how you propose to locate it?—Knowing the area that the work can protect, we take the area that it commands and would then get the Revenue Officers to pick out the land that would pay best for its protection. Then ascertain which of the people would be prepared to

put their areas under protection. It may be done either voluntarily, or we might have a law to get the land under protection. But I think we would get the people voluntarily to put the land under protection without any difficulty.

49. Q. Suppose you have a tank irrigating, according to your estimates, 1,000 acres, over what area would you extend that protection—would you extend it only to 1,000 acres or would you spread it over 2,000 or 3,000 or 4,000 acres?—If we had to work with the strictest economy we might select the land nearest the work. It would be better to take three times the area that the work could irrigate and extend our protection over that area, because that will afford greater protection in years of drought as each area that is protected would have a certain amount of dry irrigation round it.

50. Q. Have you any idea, in regard to areas that are already protected under existing tanks, as to the extent of dry cultivation they have?—I should say in certain cases it would be three or four times the irrigated area.

51. Q. You think ~~is~~ is?—Yes; because the tanks that we have at present are generally small tanks lying low and the higher ground round them is cultivated to a great extent; in fact, all but the tops of the ridges, where the soil is not very good. In Raipur, for instance, the tops of ridges are not cultivated while the rest of the land is cultivated.

52. Q. You cannot say what is the exact average proportion of dry cultivation to wet?—That I could not tell you. Mr. Sly would be able to tell you that.

53. Q. If you allowed a man to have one acre of wet cultivation to three acres of dry, you would extend the protection over four times the irrigated area?—Yes, though it would cost extra in distribution in the greater length of the channel and loss in percolation.

54. Q. (The President.)—Would you anticipate finding wet and dry cultivation mixed up in that way, that is, a field of wheat alongside a field of rice?—Not where you have rice; there you have to take the whole plot. But where you have wheat and extend the irrigation to the wheat area, rice begins to be planted, and then you have them mixed. You might have juar and cotton on dry land and ~~use~~ some portion of the land near it for rice. But wheat and rice come at different times. Rice is a monsoon crop, and wheat a winter crop. Very often they take catch-crops of rice, and then sow wheat on the same land in the winter months; for instance, in banded fields under the *haveli* system in Jubbulpore, there is something like 50,000 acres on which they take a crop of rice before the wheat crop.

55. Q. Do you mean to say that there are 50,000 acres of double crop land?—Yes.

56. Q. (Mr. Higham.)—I understand that where you have rice cultivation you have not much dry cultivation?—Yes. We have not much dry cultivation in rice lands. In regard to rice lands it would be better to select our area as near the reservoir as possible.

57. Q. I think that all your calculations are based on the assumption that you are going to irrigate rice lands?—Yes. We have decided to take up the whole of the works in the rice areas first until we get more information about wheat areas.

58. Q. Supposing you protect certain areas under rice in the way you suggest, and suppose there is a dry year when there is a strong demand for water for dry crops, how are you going to irrigate them?—We would not irrigate them, because dry crops would not be under protection. We could not irrigate land outside of the "protected" area. We have calculated our works for irrigating the protected area only.

59. Q. You calculate that you require so much water for rice; suppose a man, instead of putting down rice, puts down sugarcane, he will want water not only in October but also for the whole of the hot-weather months?—Our calculations at present are for rice, because sugarcane is grown only on a very small area now. We have not taken out the calculations in detail for each crop yet. In estimating finally the area that each work can protect, we will consider the requirements of each crop separately; fix the duty for it, and then work out the area that the scheme can protect.

60. Q. You will have to know exactly what people are going to do before you begin?—To a certain extent; we provide in our projects for the improvement of crops, but we are not providing for change in crops.

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*Note on Irrigation in the Central Provinces, paragraph —102.

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61. Q. (The President).—You are providing for a tank containing water before the beginning of the monsoon?—Yes.

62. Q. You want water on the 1st of June?—Yes.

63. Q. If there is a great demand for wheat in the rabi, would you still reserve water for the hot weather?—Yes. If there is to be any rabi under protection we will calculate the water that will be needed for it.

64. Q. (Mr. Higham).—You propose to select beforehand the lands of particular owners who express a desire to take water and to confine protection to them?—Yes; we will give water only to those who will put their lands under protection. I think we must know what land we are going to give water to. Of course, there may be a provision by which one cultivator can remove his land from protection, and another place his lands under protection in his stead.

65. Q. Then you will have a system of applications before you open your works?—Yes; we would ascertain what amount of land the people are likely to put under protection.

66. Q. Is that necessary; instead of confining the supply of water to particular plots, could you not distribute the water to everybody rateably, would they not all apply for it?—Yes; It would be for the Revenue Officers to say whether that could be done.

67. Q. The system that you contemplate seems to favour those who come first in the field and to exclude others?—No. We will get our land as near the tank as possible, and we will go further away if we don't get a sufficient area under protection near it.

68. Q. That would be to concentrate the benefits of protection to a few individuals who come first with their application. You would take the whole of those applications and you would guarantee protection for their lands, while others will be left out in the cold?—We would not have water for more than a certain area.

69. Q. But you should distribute what you have over as wide an area as possible?—We can have different chaks and irrigate certain portions in each without having one chak nearest the work and distributing water there. But that would rest with the Revenue Officers who would make the best arrangements. All that we can do is to guarantee a certain supply of water for a certain area.

70. Q. You would not allow a man to put in sugarcane unless he had applied for water beforehand?—Unless we know that he requires water for sugarcane, how can we say whether could give him water for it or not.

71. Q. You would not allow him to irrigate as he likes?—I don't think we could do so unless we find that our supplies exceed the demand. If we find that we have water to spare, we can give extra water to sugarcane.

72. Q. You assume that you will get Rs. 2 for every acre that you protect?—I think that we can rely upon getting Rs. 2 eventually.

73. Q. Is that an all-round rate or is it an average of a scale of rates? Would you charge a higher rate on particular crops or have an all-round rate?—I think we should have a scale of rates on account of the varying soils that will be put under protection. There are certain soils in which the best class of rice can be put down, while there are others in which you cannot put down the best class. For instance, the higher soils in Raipur will not take the best class of rice. If you irrigate them, you could only put second class rice on them.

74. Q. Would you have a special rate for garden crops or sugarcane which would want water all the year round?—Yes. There would be a special rate for sugarcane.

75. Q. If you guarantee protection to a certain area you would fix the water-rate for the whole area, whether water is required for a particular year or not? Suppose it was a wet year and nobody wanted water, they would still have to pay Rs. 2?—Yes. They know that water is kept for them for the following year in case of drought.

76. Q. If a man puts down sugarcane you would charge him Rs. 2 and something extra for cane?—Yes. Practically it is a double crop as it takes water throughout the year. Our rate of Rs. 2 is for rice which has a season of 4 months, but if we had a crop extending over 6 or 8 months we should charge a different rate.

77. Q. What is this Rs. 2 rate based upon?—On our experience at present in Chanda, Bhandara and Nimar. In Chanda at Sindawahi village they pay Rs. 3 per acre per crop for rice, and at Kachapar

village Rs. 6-5-4 for sugarcane. At Lachora tank in the Nimar District Rs. 4 per acre is paid for irrigating rice and wheat and Rs. 10 for sugarcane.

78. Q. To whom they pay?—In Nimar they pay to the District Council.

79. Q. Is the irrigation from a tank?—From the Lachora tank.

80. Q. Then why should you suppose that we would get only Rs. 2?—The reason why I suggested Rs. 2 was, that in the Bhandara District it is more or less the recognised rate for the sale of water from the village tanks at present.

81. Q. That is in years when they want water?—They can only have water when it is available. If a man has water in a tank he need not give it to another person unless he can spare it, but if he gives it, he charges him Rs. 2. The cultivators are guaranteed no protection.

82. Q. If a plot of land is guaranteed water through all seasons and there is a great chance of an increase in the yield, Rs. 2 seems to be a small rate?—I admit that. I think it should be higher, but at present a higher rate is not recommended. The Revenue Officers would not recommend even Rs. 2 to start with.

83. Q. That is the maximum that the Revenue Officers can be got to recommend?—Yes.

84. Q. Even that would not be introduced immediately?—No. They do not expect to get that at once. We may get it in some places. In some portions of the Bhandara District people might willingly come forward and take water at this rate, but in other districts they may hold back till they ascertain what the benefits from irrigation actually are.

85. Q. Have your malguzars and others among the people expressed any opinion as to what they would be willing to pay?—You will probably have a malguzar coming before you and he will express a definite opinion. He is the man who sold water during the famine at Rs. 20 per acre.

86. Q. What is the normal rate?—The normal rate for selling water in Bhandara is Rs. 2. That is what they recognize generally.

87. Q. (The President).—That is what the owner of a tank gets?—Yes. He gets it in the year a man takes it.

88. Q. (Mr. Higham).—Can you tell me something more about the tank in Nimar; under what conditions did it fall into the hands of the District Board?—It is an old tank constructed in the time of the Moghul Emperor. It fell into disrepair and was not being used. When Colonel Keatinge was the Deputy Commissioner he had it repaired and renewed. It was then handed over to the District Council as the best body to work it, and they have been working it since.

89. Q. Does the District Board find money for repairing it or is it repaired by the people?—That I cannot tell you. It was repaired many years ago and the District Board did find the money for those repairs.

90. Q. How is it maintained—by the people or by the District Board?—The District Board.

91. Q. They keep an establishment?—There is very little establishment required.

92. Q. Has the tank been in good repairs?—No; there was a leak in it which reduced the supply in 1899. That is the reason why irrigation has been falling off. The leak is there still and it is not repaired. It requires to be opened up at the leak and then carefully repaired.

93. Q. Why do not the District Board repair it; can't they afford to do it?—No.

94. Q. Do they get a water-rate?—Yes. But it has dwindled down to very little, the area irrigated being very small.

95. Q. But according to you they got a very good rate?—Yes. The area that is irrigated was about 300 acres, but it has run down to some 80 acres.

96. Q. Has it dwindled owing to this leak?—Yes, to a great extent.

97. Q. Do not the District Board think it worth their while to keep it up?—I cannot tell you the details, but I know that it is not being repaired. There is no doubt that the area has fallen off.

98. Q. Looking at the tank as a commercial speculation; you say that the tank was made by the Moghul Emperor and all that the managers had to do is to prevent it from leaking and to keep it in an efficient state of repair. Apparently they do not find it worth while to do so. Is it due to the fact that they do not

get enough income to keep it in good repair or is it due to the inability of the District Board to manage it?—The area irrigated has fallen off considerably and the little revenue they get does not cover the expenses.

99. Q. Why did it fall off?—The rate had something to do with it. The rate of Rs. 4 is too high. Very possibly it may be due to the inattention and bad management by the District Council. In a note sent by the Executive Engineer he says that it has fallen off owing to the high rate demanded for irrigation, viz., Rs. 4 and Rs. 10 on sugarcane.

100. Q. (Mr. Craddock.)—Were the rates increased?—Yes, from Rs. 2 to Rs. 3 and then to Rs. 4. The District Board lowered the rate in 1899, but there was very little water, and the people found that even though they paid this rate they could not get water.

101. Q. Are there many irrigation tanks in zamindari areas?—There are two small irrigation tanks—one in Nawegaon in Bhandara and another in Seoni in Bhandara.

102. Q. Whose property are they?—The malguzars'.

103. Q. Do they charge anything for water-rate?—One malguzar, who will give evidence, does not charge anything.

104. Q. Are they any large irrigation tanks in such areas?—No. There is a tank at Wararband in the Raipur District, but it is not used for irrigation.

105. Q. You have submitted a great many projects. Supposing it is decided to make a commencement and to begin the works, in what order would you recommend them to be taken up?—I would recommend the best projects in the most distressed parts of the country.

106. Q. What do you mean by the best projects?—The most promising projects.

107. Q. From a revenue point of view?—Not only from a revenue point of view. The projects that the Revenue Officers would suggest starting with. For instance, any projects that you take up should be projects in places where people would welcome irrigation. That will show other people the benefit.

108. Q. Would you start the work in one district?—In parts of Bhandara, Balaghat, Raipur and Bilaspur.

109. Q. In four different districts?—Yes.

110. Q. (The President.)—Have you got complete projects in all these four districts?—Yes.

111. Q. (Mr. Higham.)—Can you tell us anything of the discussion that took place in the seventies about irrigation in the Wainganga valley?—Projects were prepared for irrigating the Wainganga valley from the Kanhan and the Pench rivers. The project from the Kanhan was to irrigate land to the west of Nagpur, the eastern parts of Wardha and the western parts of Bhandara. A greater part of this country was cropped with *juar* and cotton which was said not to require irrigation. The project was an extensive one, and when it was submitted to Government of India they replied that it was too expensive and suggested the submission of smaller projects. Then a scheme was proposed from the Pench river. The point of that scheme was an anicut and canal from the Pench, supplemented by a reservoir at Ramtek on the Sur river to irrigate a portion of the country to the north-east of Nagpur and the west of Bhandara. This project was submitted and was also said to be too expensive. The order of the Government of India was that the estimates for the projects were to be cut down to 12 lakhs. These three schemes were then revised. Sir John Morris, who was then the Chief Commissioner, strongly recommended that the Nawegaon tank reservoir, the revised estimate of which was Rs. 9,61,958, should be sanctioned as an experimental scheme.

112. Q. What year was this?—This was in 1874. The project was submitted to the Government of India and it was finally decided that the State would not sanction a project on so large a scale, and further investigation was stopped, as it was considered that irrigation was not urgently needed in the province, and there the project ended. Just at the time that this project was under consideration, it appears that a report was asked for from the Inspector-General of Irrigation on the possibilities of irrigation in India, and the tank project of the Central Provinces was put down about the 9th on the list, which meant that it would not be sanctioned till about 1900. Then Colonel Mayne, who was the Chief Engineer at the time, in a Note to Chief Commissioner, said that this meant that irrigation in the Central Provinces was practically shelved, and that in order to protect us

from famine it would be as well to have a railway communication to bring in grain supplies when necessary. It was then that Sir John Morris asked for the Nagpur-Chhattisgarh Railway.

113. Q. Because he could not get a canal?—Because he could not get irrigation.

114. Q. Has the Ramtek project been worked up? It was revised and full details were submitted to the Government of India. It was approved, because the Government of India in the reply mentioned that the project had been carefully prepared. It has now been brought into line with other projects.

115. Q. Have you got it here?—Yes.

116. Q. Will you show us the general plan?—Yes.

[At this stage the scheme was explained by the witness by the aid of the plan.]

117. Q. (The President.)—As regards this scheme what would happen in a year of such drought as you have had? It would protect an area of 32,000 acres. That has been worked out from the rainfall statistics for a series of years.

118. Q. You could count upon this reservoir having a large supply even in the driest year?—Yes.

119. Q. What is the extent of the catchment area from which it draws water?—82 square miles.

120. Q. The soil is chiefly black cotton?—Chiefly black cotton but a good deal is *muram*.

121. Q. (Mr. Muir-Mackenzie.)—I should like to put one question—it is a question which I should perhaps address to my colleagues and do not to Mr. Harriott—as to whether it is not a wasteful method to build a tank to contain a great many more millions than are required in a famine year. You will store 1,000 millions?—Yes.

122. Q. And then you give out only 2,000 millions and odd?—Yes.

123. Q. You have to leave the rest for the next year?—Yes.

124. Q. Then that means that you have to build a very large tank in order to give a small supply?—We don't do it in that way. We design our tank so as to take the greatest advantage we can of the site; we then estimate the area which the tank as designed will project.

125. Q. That is, I understand, that you work out the area from conditions of minimum rainfall in a series of bad years?—Yes.

126. Q. You store enough water to irrigate a very much larger area in a good year?—Yes.

127. Q. In order to give 2,000 millions you have to store 4,000 millions and you have to make a big tank?—Yes.

128. Q. Is not that a very expensive method of storage?—The expensive part of it is the loss by evaporation between October of one year and June of the other. If we do not provide for this we cannot have the area protected.

129. Q. (Mr. Higham.)—That is just the point I wish to ask. Putting protection on one side, you would get greater revenue by working in the way you propose than you would by emptying the tank every year?—I think so.

130. Q. If you empty it in years when there is plenty of rainfall you will get a very small rate indeed?—Yes, as a matter of fact, there are many years in which probably no water will be taken.

131. Q. But if you reserve it for a year of drought, the cultivators will be able to pay all round a higher rate than they otherwise would?—Yes. For giving them protection we can ask a fair rate.

132. Q. (Mr. Muir-Mackenzie.)—Is it to be paid every year or only in the protected year?—Every year.

133. Q. (Mr. Higham.)—This Ramtek tank according to your table is one of the cheapest and the most promising of all on the list?—Yes, it is.

134. Q. Is it one that you would propose to begin at once?—Personally it is one that I should propose to begin at once. I think it is a very good experimental scheme. It will to a great extent solve a great many questions. Not only will it show what irrigation can do, but also how far it can be extended on black cotton soils. If it proves a success, it opens up irrigation from the Pench and the Kanhan, by which we could protect a large area.

135. Q. There are two objections raised against it. In the first place it is all cotton cultivation?—It is wheat, *juar* and linseed. There are about 7,000 and odd acres of garden crops and rice.

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136. Q. There are 7,000 acres of rice now?—Yes.
137. Q. That would extend if water were made available?—The Deputy Commissioner in his Note says that it would.

138. Q. To the extent of 32,000 acres?—Whether it would exactly go to that extent I cannot say.

139. Q. 16,000 acres would be rice and 16,000 acres would be wheat?—Yes.

140. Q. The other objection is that this part of the country does not want protection?—It does not want protection as much as other portions of the province. But it did suffer in the last famine.

141. Q. (Mr. Craddock.)—There was no relief work there in that year?—No; but there seems to have been loss of crops.

142. Q. (Mr. Higham.)—Still such protection as you could afford is much less than what you would give to other parts?—Yes; I recommend this project as an experiment because it will be a favourable one. There are some other big projects which are now being worked out in detail.

143. Q. In that plan which you showed us the area that is marked for irrigation by the Ramtek project is said to be 62,000 acres?—Yes. The red portion.

144. Q. You say you would irrigate only 32,000 acres?—Yes.

145. Q. That would be half the area commanded? That only refers to the portion marked red. But if the Ramtek project is worked as proposed, we can irrigate right down to Bhandara, where there is good rice cultivation.

146. Q. That is what I was going to ask you. Would you confine yourself to that tract or would you go beyond that?—In regard to that particular scheme, I would like to go beyond that.

147. Q. (The President.)—Is it a part of your project to feed existing tanks?—Yes. As a matter of fact, in the Central Provinces we have to combine direct with indirect irrigation—in Chhattisgarh especially.

148. Q. (Mr. Higham.)—Suppose you make all these tanks and canals that have been proposed, how do you suppose that they will be maintained—will they be maintained entirely by Government or by the people?—We will have to do the repairs to masonry works and to embankments; but I think the people could be got to clear the channels every year.

149. Q. You allow certain rates in all your tables for maintenance?—Yes.

150. Q. Eight annas per acre?—Yes.

151. Q. Does that include the keeping of the channels in order?—It excludes that. I reckon on channels being maintained by the villagers. I assumed as a minimum a scheme that could protect 800 acres, and I estimated in my Note that Rs. 400 could maintain such a scheme, but the greater number of our works will protect a much larger area and the cost per acre will be proportionately smaller.

152. Q. You contemplate that the people themselves will keep the channels in repair?—Yes.

153. Q. Are they not likely to clear out channels to twice their proper width?—I do not think that they will do any more work than they have to do. They would not be able to secure more water by widening channels, because the supply depends on the outlets.

154. Q. If Government were to repair all the works the rate would have to be increased?—It would probably have to be increased to 12 annas.

155. Q. In the estimates for these works you propose to acquire for Government the whole of the area that will be submerged by the tanks?—Yes. We propose to take up not only that, but also the area that will be taken up by channels—the land required for main channels.

156. Q. The question has been considered in other provinces whether it is always necessary to compensate the people for the land taken up for the purposes of a tank; whether they would not allow you in many cases, not in all, to store water provided you do not interfere with the rights of ownership and you allow them to cultivate on the margin of the tanks if the tanks run dry, and also allow them to cultivate the bed in the dry year?—I think there are cases in which some proprietors might forego compensation for land on the lines suggested or for small areas where they could get a crop in the winter along the border of the tank when the water surface recedes. Of course we could not rely on this in every case.

157. Q. Any estimates made for tanks should provide for full compensation; but what I mean to say is that men should be allowed the option of foregoing compensation provided the Government could have such control as is necessary to give as much water and run it out as much as it pleased. This would reduce the cost of many of the works and it would also very often overcome the opposition of people who do not like to give up their land. I only mean to suggest this point so that it may be considered when any difficulties arise with a view to overcoming opposition?—I think possibly there may be cases in which some proprietors might forego the compensation in order to retain the proprietary right in the land.

158. Q. (Mr. Craddock.)—This would also reduce the amount to be paid as compensation?—Yes.

159. Q. (Mr. Muir-Mackenzie.)—I want to try and get clear as to the degree to which the province is liable to famine and the circumstances under which that liability occurs. I see from your rainfall statistics there were only two years in which the rainfall was deficient?—Only two years, when there was absolute failure.

160. Q. That was in 1868-69 and 1899-1900?—Yes.

161. Q. On the other hand in 1868-69 there seems to have been only partial scarcity. There was nothing like what occurred in 1899?—There was acute distress in about eight districts, but I do not think it was felt throughout the province or as severely as in 1899.

162. Q. It was only the heavy rainfall in September that saved the greater part of the country, and acute distress was confined to certain districts that are mentioned in your note?—Yes. They were Saugor, Damoh and Jubbulpore in the north, Bhandara and Balaghat in the south, and Chhattisgarh.

163. Q. Apparently it was not a distress or famine like that of 1899-1900?—Apparently not.

164. Q. On the other hand in 1896-97, you had excessive rain?—It was a year in which there was unreasonable rainfall.

165. Q. It was excessive on the whole?—Yes.

166. Q. And yet you had a severe famine?—Yes; but it was not caused by the heavy rainfall.

167. Q. What I want you to let us know is, how far your projects of irrigation will provide against a year of totally deficient rainfall. I understand that the Ramtek tank would fill. Are you confident that all other tanks would fill?—We have taken the worst series that has occurred in 33 years and we have estimated the area that could be protected through them to a year of minimum rainfall. It is to guard against years of totally deficient rainfall that we propose working on this protective system.

168. Q. How far would other means of irrigation—means auxiliary to irrigation—serve you in a year of totally deficient rainfall; would the *haveli* system of irrigation be of any use in such a year?—It has been of use in these two famine years.

169. Q. Wherever it has been practised?—Yes.

170. Q. The land under it had full crops?—I do not think they had full crops.

171. Q. An appreciable crop?—They run up to 8 annas in Jubbulpore.

Mr. Craddock.—They did very poorly in 1899-1900.

172. Q. (Mr. Muir-Mackenzie.)—Would the *haveli* system of irrigation in wheat land be an efficient protection in a year of utterly deficient rainfall like 1899-1900?—From what a gather, people seem to think that they could get somewhere about 8 or 10-anna crops.

173. Q. You are unable to form your own opinion?—Yes, because I did not see any part of the wheat country in these years. I have been in the rice country.

174. Q. (The President.)—I gather that *haveli* is a *rabi* system?—It is a combined system. In some parts they take a crop of wheat during winter and a catch-crop of rice during the rains.

175. Q. (Mr. Muir-Mackenzie.)—There is another system that has been auxiliary to larger schemes of irrigation—bunds across *nallas*?—Yes.

176. Q. That is different from the *haveli* system?—I think it is more or less included in the *haveli* system. Do you mean tank bunds going down the *nallas*?

177. Q. Yes; have you seen anything of such a system?—I have seen it in some places. You have a number of bunds down a valley, and sow behind the bunds.

178. Q. Were any good crops obtained in 1899-1900?—That I could not tell you.

179. Q. Coming to wells, did not wells give good crops in 1899-1900 for such areas as were irrigated?—In wheat areas it did.

180. Q. Would you not be prepared to say that, as a measure of protection in wheat areas, there is nothing so efficient as wells for a year of totally deficient rainfall?—For the area they can irrigate, well irrigation is effective. But the area they do protect is small.

181. Q. Was the amount of water in the wells very much less in 1899-1900 than in ordinary years?—Yes, I should say it was. But the wells did seem to meet the demand made on them.

182. Q. They irrigated as much as usual?—Yes.

183. Q. You think the water level was materially lower?—Yes, but they got what they wanted.

Mr. Rajaratna Mudaliar.—On page 12 of the Note on irrigation you find the figures given. It is 64,000 acres against a normal of 74,000 acres.

184. Q. (Mr. Muir-Mackenzie.)—Some witnesses, if I understand the papers rightly, have advocated encouragement being given to people by granting takavi on liberal terms to enable them to build tanks for themselves. Would these small tanks such as the people are likely to build, be of any use in a year like 1899-1900?—No, the rice districts of this province show that they would not.

185. Q. On the other hand, in a year like 1896-97, when there was large rainfall in the beginning of the season, would they not be of very great value?—They were not as valuable as it was anticipated that they would be.

186. Q. I gather from Mr. Sly's statistics that in the year 1896-97 the area irrigated from tanks was 647,000 acres. That was nearly the largest area on record?

Mr. Craddock.—Much of that irrigation was imperfect. They might have had one small watering.

Witness.—If you look at page 12 you will find that the area irrigated under tanks fell from 536,213 acres in 1894-95 to 176,997 acres in 1899-1900.

187. Q. (Mr. Muir-Mackenzie.)—The explanation, I understand, is that the irrigation was of an imperfect kind.

Mr. Craddock.—It was partly because the rainfall was excessive and up to the end of August they let a lot of water go. They had a series of three wet years and the rainfall promised so well up to the end of August that a great many were careless.

Mr. Muir-Mackenzie.—Nevertheless they did some irrigation.

The President.—Do you know whether the rains fell continuously?

Mr. Craddock.—Yes, till about the last week of August.

Witness.—There is one other point. Many of these small tanks were damaged by heavy rain. A big plump of rain damages small tanks. Whenever we get a plump of rain small tanks fare worst. A part of the bund gives way.

188. Q. (Mr. Muir-Mackenzie.)—Are these small tanks kept in good repair or bad repair?—I should say, personally, they are kept in very poor repair.

189. Q. Do they breach frequently?—Yes, when we get a good plump of rain.

190. Q. Are breaches promptly repaired?—In a way they repair them; they patch them up.

191. Q. Would you recommend that Government should examine these tanks with the object of instructing people in making better arrangements for the waste weirs?—Instruction might be helpful in the case of waste weirs. But as far as the construction of these tanks is concerned, people are quite able to do it themselves. I do not think the interference of Government will do any good. But in connection with large tanks which we are to fill, I certainly think the Government should help them to make them properly and to provide proper sluices.

192. Q. When tanks are filled from Government storage?—Yes.

193. Q. I see from Mr. Hutton's Note appended to yours there were some old breached tanks?—There are very few. At present they are not likely to be taken up or immediately wanted. Either the people have left the villages or they are not using them. They let the land go to waste.

194. Q. If the tank was repaired would not people come back to the village and take up the lands?—Not readily. They might in time. In every district I asked about it, and the reply was that they were tanks from which we would get no immediate benefit.

195. Q. Are they very few?—Yes, very few.

196. Q. Are they silted up?—Not silted up. The bund had been breached and the owner was too poor to repair the tank, and so it has fallen into disuse.

197. Q. Are they small?—Yes.

198. Q. No tanks which could irrigate several hundreds of acres?—Many of them could only irrigate 50 acres, sometimes 100.

199. Q. We shall want a good deal of information about famine programmes. Will you be able to get it for us?—Mr. St. Clair, Superintending Engineer, is the officer who can give you the information. As far as our famine programmes go, I have estimated the value of the work that can be done by famine labour for all the projects and have included them in the supplementary note under the column "Amount of work that could be done by famine labour." You will see in column 18, the extent to which the work can be carried out by famine labour and the probable cost of the project.

200. Q. Will you be able to put in a full programme of famine works?—I can get that from Mr. St. Clair.

The President.—It has been particularly suggested to me by Mr. Ibbetson to see the excellent system you have of maps illustrating your programmes.

Mr. Craddock.—They were prepared for the last famine.

201. Q. (Mr. Muir-Mackenzie.)—I suppose that a large number of your projects are suitable for employment of famine relief labour?—Yes.

202. Q. You say that famine labour could be suitably employed on *haveli* or *nalla* bunds?—I should say that famine labour can be employed profitably on them.

203. Q. There would be no difficulty of organization?—I should not think so.

204. Q. So long as the Public Works Department gave the levels the works could be carried out by the Civil Department?—I think so; we could assist them with levels.

205. Q. Did the Public Works Department employ famine labour on such works?—Very little.

206. Q. Is it not necessary to make waste weirs for these bunds?—It is very necessary. I can give you a case in point. Sufficient room should be left for flood water. I inspected three fields belonging to Nathu Ram, Malguzar of Saugor. He had two bunds one above the other. The top bund got breached and the whole of the crop above the top bund had failed. But the portion between the two bunds—the lower one did not breach—had a beautiful wheat crop when I saw it in November.

207. Q. (Mr. Rajaratna Mudaliar.)—Were any irrigation works undertaken during the last famine?—Only small tanks. There were a few larger tanks taken up in Raipur and Bilaspur. They were started but not finished.

208. Q. Do you think it is necessary to complete these works?—They should be completed at once.

209. Q. At once or reserved for another famine?—At once. What we require at present are really some works which will give us data.

210. Q. If they are not completed, all the expenditure hitherto incurred will be wasted?—It would mean that a certain amount will be wasted, but not all. Even later on we could utilise some of the works already done.

211. Q. There are over 31,000 tanks in this province. Are they all private tanks?—They are all private tanks except Lachora, which is worked by the District Council of Nimar.

212. Q. Does the Government derive any wet revenue from these tanks?—Yes. I think a wet rate is put on the land that is irrigated from the tanks. It is included in the rent.

Mr. Craddock.—Irrigable land is assessed at a higher rate.

Mr. Muir-Mackenzie.—It is the Settlement Officer who actually determines the rate. Is it not?

Mr. Craddock.—Yes.

213. Q. (Mr. Rajaratna Mudaliar.)—The revenue under the tanks is not given?—It would be very difficult for me to arrive at that.

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214. Q. (Mr. Muir-Mackenzie.)—Are not the rent-rates of particular villages recorded?

Mr. Craddock.—It is fixed on the holding as a lump.

Mr. Muir-Mackenzie.—Is there any record of rent-rates?

Mr. Craddock.—There is a record of rents from which we can deduce the rates.

Mr. Muir-Mackenzie.—Would it be possible to get a statement as to that?

Mr. Craddock.—I think so. It is perfectly possible to get a general statement. The rates vary greatly

In parts of Hoshangabad there are *kachcha* wells near rivers where the soil is hard and there they have been useful. They do prove useful to a certain extent in years of drought. But I would not recommend them to be run as protective works.

228. Q. (Mr. Craddock.)—You said that your information was that malguzars and other people when they gave water took Rs. 2. Is that so?—They sold water at Rs. 2 an acre.

229. Q. Is it not the case that a man pays for water for every year that there is water in the tank, and he does not pay in those years when there is no



243. Q. Do you not find that in rice lands people are much more dependent on a single crop of rice than people in the wheat country on a single crop of wheat?—Yes, because in the wheat country they grow cotton and jwar too. They have other crops.

244. Q. (Mr. Muir-Mackenzie.)—The bunded up fields under the *haveli* system are never fit for growing cotton?—I believe not. They don't grow the cotton and jwar in the bunded fields.

245. Q. (Mr. Craddock.)—I understand you to say that you prefer to start irrigation works in rice tracts?—Yes. All the projects that we have taken up at present are confined to rice tracts. We examined only a few of the projects in Saugor outside the rice tracts to see what the storage would cost.

246. Q. In the rice tracts how would you work in with the existing system of irrigation. There is a lot of land irrigated, and very much of it is fairly irrigated under existing tanks. Will a man who has got a tank and spent a lot of money on it be willing to pay as much for the benefits of occasional irrigation as a man who has no irrigation now?—I think you will find that most of our projects are such as are necessary for feeding the existing tanks.

247. Q. Should you charge anything for feeding the tanks?—It depends upon the extent of our supply and the means of the man who owns the tank. We might not assess the land, but we might charge him for the amount of water that we give him.

248. Q. You must have a sort of commutation?—Yes, in cases like that, where a man had a scheme of his own. But in most of those cases, I think we should find that the works that we have designed will irrigate a sufficient area outside the area which is irrigated under the existing tanks.

249. Q. You said that the Ramtek project was a good one for an experiment?—Yes.

250. Q. Don't you think that it is too expensive for an experimental scheme?—I do not think that it is too expensive for a Government like that of India to test the capabilities of irrigation in the province.

251. Q. The scheme costs about 10 lakhs. Is it not?—9½ lakhs.

252. Q. Don't you think it would be much better to put the 10 lakhs into rice country, where you have a sure and certain ground, and to put a much smaller sum into the wheat tract. So that if the experiment is a failure you would not lose so much?—I think projects should be taken up first in rice tracts, which need irrigation most. But it is also a very important question as to how far we should protect wheat areas, and if funds can be provided for the Ramtek project without retarding the construction of irrigation works in rice areas, I think it should be taken up. We have got large areas under jwar and cotton which we cannot protect at all. How are we to arrive at any decision as to the best means of dealing with these areas without an experimental scheme?

253. Q. You are not asked to protect cotton and jwar?—We might improve cotton. There is a certain class of cotton which might be improved, and jwar may give way to other crops that can be irrigated.

254. Q. There are possibilities, but they are remote?—I do not know. Only the other day there was a person from Calcutta who was pushing the

growth of cotton in this district. He was supplying seed in Raj-Nandgaon for cotton cultivation. He has already succeeded in getting some area under cotton cultivation.

255. Q. The chief thing that he is afraid of in Nawegaon is the damage by the excessive rain?—That is in regard to the present crop. You will admit there is cotton which can be irrigated and which will be better than the one we are now growing.

256. Q. The difficulty is that our cotton and jwar tracts and the low-lying land that you would be able to irrigate were absolutely secure in the year 1899 and they had very fair cotton?—There is no doubt that cotton and jwar do not require protection and I do not advocate their irrigation. But I think it is possible that if facilities for irrigation are provided, a change of cropping may be effected and crops grown which can be irrigated.

257. Q. Where it does require irrigation is on slopes of hills where you can't irrigate?—Yes, on ridges and slopes of hills, where it is stony. Cotton and jwar do not need irrigation. But the question is whether we could not get a change of crop. Take the case of jwar. It is sown in June or July and is reaped in December, so that only one jwar crop can be got from the land, but with irrigation we can get two crops—you can get rice and wheat or gram. Which is more profitable—whether to allow the land to go on producing one crop of jwar or to produce two crops, one of rice and one of wheat?

258. Q. If I may sum up your general conclusions—tell me whether I am correct or not—they are that you consider it as proved beyond demonstration that irrigation is possible and necessary in our rice tracts?—Very necessary.

259. Q. And that you think it highly probable that it will also be almost equally beneficial in our wheat tracts?—I should not say almost equally. But I should say very beneficial outside *haveli* or bunded tracts which includes a system of irrigation.

260. Q. And that at present there is a great deal of doubt about cotton and jwar and that as regards those tracts you would like to see more experience gained?—Yes.

261. Q. You would not like to embark on large or expensive schemes in those other tracts?—I should prefer to see rice tracts taken up first. But I do not see why we should wait till all the rice tracts are taken up before constructing works to gain experience in other tracts.

262. Q. You would like to take up smaller works in wheat tracts and if they are found successful you would take up larger works?—Yes.

263. Q. (The President.)—I just wish to ask you one question. You have a great number of projects; if you were asked to select one out of them to be put into early execution, as an object lesson and an experiment which would you recommend?—I would like to do it in consultation with the Revenue Officers; we should select a project which we know will be taken up willingly by the people and at once.

264. Q. On that point you would like to compare notes with and consult the Revenue Officers?—I would consult the Revenue Officers in regard to every project before I would recommend its commencement.

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WITNESS No. 2.—MR. A. B. NAPIER, I.C.S., Late Settlement Officer, Bhandara.

Replies to printed questions.

1. Q. My replies refer to the Bhandara District in which I was Settlement Officer for five-and-half years.

3. Q. (1) In the east of the district there are many excellent sites for tanks of which use has not hitherto been made, partly no doubt on account of sparsity of population, but more on account of want of capital and want of agricultural knowledge on the part of the agricultural population which here belong chiefly to aboriginal tribes.

(2) In this tract cattle are numerous and, though not very large, they are capable of doing ordinary agricultural work.

(3) Manure is generally as plentiful as elsewhere.

(4) Throughout the district the soil is suitable for rice cultivation irrigated from tanks. A few tracts of level black soil are embanked and not otherwise irrigated, but this is probably due not to unsuitability to irrigation but to the non-existence of sites for tanks.

(5) The rainfall is generally sufficient to fill irrigation tanks.

(6) Lack of capital, though operative throughout the district, to a certain extent is certainly one of the main reasons for the failure to build tanks in the eastern tracts to which I have called attention. This lack of capital is felt more for the initial cost, as the cultivation of irrigated rice is not so much more expensive than that of unirrigated rice to cause any apprehension.

(7) My experience is that there is no great fear of incurring enhancement in rent or revenue. Even though our system of exempting improvements from assessment may not be fully understood by the people from whom it is obscured by the statistical method of calculating rents, still the increased profit of cultivation is so large and the general belief in the fairness of Government sufficiently great to obviate any fear of eventual loss.

(8) No doubt there is some feeling of uncertainty of tenure in the minds of ignorant cultivators, especially in the zamindaris. It has no real basis in law, but in fact the zamindar is called the Raja, and it is not realized that his autocratic powers are limited by the Tenancy Act.

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(9) Lack of capital and want of agricultural knowledge have been mentioned as obstacles to irrigation. Further, in the Eastern Zamindaris the nomadic instincts of the population must be taken into account and their horror of debt. I remember being unable to make a Kavar in Chichgarh understand that Rs. 100 I offered him to make a small tank was a gift; he would not have it; and I have had tenants in this part beg me not to record them as occupancy tenants.

4. Q. Land improved by the owner is assessed at the next revision of Settlement as if it had not been so improved. Thus the improvement is exempted for the number of years intervening between the date of its being made and the date of revision, plus the term of the revised Settlement, i.e., for about 40 years as a maximum and 20 years as a minimum. This applies to proprietors and tenants equally. I think these provisions are quite sufficient for small works, but do not encourage large expenditure which, however, is often made from commercial reasons. A suggestion made by Mr. Sly that the area irrigated from a large work should be given to the maker for ever on a quit-rent varying with the land revenue seems to me to be excellent. It is similar to the grants made by native rulers; would be more easily understood than our present method of exemption for improvements, and because it would carry the honorific title of mak-tadar, it would act as a direct incentive to building large tanks. I am inclined to think that the right to hold on such a quit-rent should not be saleable except with permission, which would only be granted as a rule when the necessity for sale was occasioned by debts incurred for constructing the tank.

5. Q. Loans for the extension of irrigation were always freely taken in the more settled parts of the district when they were offered in the village, and generally even if applicants had to go to tahsils for the money. There are a good number of difficulties however in the latter case: long delay in getting sanction, fruitless visits to cutcherry while enquiries were going on, and possibly the necessity for the applicant to ingratiate himself with underlings.

I recommend that loans should almost invariably be given on tour, and would endorse an opinion I saw somewhere, that executive officers should be bound to give a certain amount during their tours unless they could give a good reason for their failure.

5. Q. (1, 2 and 3) I do not recommend either reduction or remission of interest or partial remission of the advance except under famine conditions. There is no trouble found in these matters; applicants for loans do not dispute the fairness of the Government measures in these matters, but there is often room for more intelligence in collection. I have known of cases where a loan for plough-cattle was taken and properly spent; a bad year followed, and the cattle were seized and sold for arrear of an instalment, and the forced sale naturally not bringing a full price the debtor lost his cattle and still found himself in debt.

(4) In the case of failure to obtain water, in the case of loans for wells and where tanks made with loans burst the first year, as they are always liable to do, I would recommend the remission of a part of the loan, but not of the whole. Such leniency would be in my opinion a great mistake and lead to carelessness in selection of sites.

(5) I do not think the period of repayment needs extension except in years of failure of crops.

(6) Grants-in-aid might be given:—

(a) when the tanks or well is required for drinking water as well as for irrigation and the village is too poor to contribute.

(b) In the cause of agricultural education in backward tracts.

6. Q. Cultivators of course drift to villages where irrigation gives them more certain crops, e.g., Mr. Buti has made a good tank in Managarh, Salekassa Zamindari, and has collected a certain number of tenants who would otherwise have been engaged in inefficient cultivation of kodo in clearings in the forests of the vicinity. There must in such cases be a little loss counterbalanced by a far greater gain.

Everyone in Bhandara is agreed that there is much scope for increase in irrigation, and strongly desire that it should be increased. In most parts they would prefer to do the work themselves, and Government works with the increase of low-paid Government officials to live on the country, would be looked on as a doubtful boon.

23. Q. (1) The Bhandara tanks are nearly all filled by the drainage of high land behind them: very few,

and these not usually irrigation tanks, are dependent on rainfall alone; there are also a few where the water of a stream (not permanently dammed) is taken by a channel into the tank.

(2) The manner of distributing water varies with circumstances. For large tanks masonry outlets are usually provided often with some sort of a tower to relieve pressure in the channel. For small tanks three cuts in the embankment are usually made, one at each side and one in the middle, but for these pipes made of hollowed tree trunks are sometimes provided.

The distribution channels are seldom made of masonry where water has to be carried over short stretches of low-lying land; use is made of wooden pipes on trestles.

(3) The periods during which tanks contain water depends of course on the catchment area and the capacity of the tank and the objects for which the water is required. Tanks used for sugarcane never fail, unless there is a serious failure in the rainfall. Rice tanks are only required to keep water till December; large tanks usually have excess water then, but if this is not wanted for drinking, it is often let out and the bed is cultivated; small tanks are generally drained dry by November. In a year of scanty rainfall the area irrigated is usually reduced so as to allow a full water-supply to the most favoured fields, and the tanks last as above. In a year of drought small tanks are often quite useless, or only give one watering after transplanting the rice; large tanks may keep water for a portion of the area irrigated till October, and sugarcane tanks can as a rule give water for the rice up to the end of November, but the sugarcane suffers.

(4) The area ordinarily irrigated by a tank can hardly be calculated for a district where the tanks vary in size from five square miles irrigating 2,578 acres to many covering less than an acre of land and irrigating a few rice bandhis. The total number of tanks and ponds used for irrigation is 17,943, and the total area irrigated in the years of attestation was 249,957 acres giving 14 acres per tank. The area shown as irrigable in the Settlement papers is 294,759 acres or 16½ acres per tank.

I have also had statistics of the land shown as irrigable from some fair tanks taken out for comparison:—

Village.	Area of tank.	Irrigable area.
	Acres.	Acres.
Adasi	37-95	320
Amgaon	52-58	316
Do.	29-94	141
Bangaon	30-20	95
Malhi	31-30	273
Khamari	47-04	292
Do.	25-02	344
Gorta	34-30	226
Tumkhera	26-20	114
Ghatbori	33-45	388
Khod Seoni	55-36	403
Palsori	130-92	507
Palasgaon	47-34	845
Siregaon	60-25	537
Sondal	170-46	433
Mangli	83-77	447
Lobhi	60-48	316
Chandpur	10-21	159
Kudwa	92-30	438
Koka	22-77	450

Village.	Area of tank.	Irrigable area.
	Acres.	Acres.
Aahiti	25.17	107
Mahakepar	44.53	121
Do.	40.53	120
Dongargaon	25.00	136
Malejunga	240.19	152

24. Q. (1) Irrigation enables a second crop to be grown in soils of fair fertility but not in all. The custom is to sow lakhori or urad broadcast amidst the standing rice. As far as I can learn 4 kuros (equal to about 40 seers) is sown per acre. There is practically no cost incurred. The outturn is small, only about three times the seed; but these pulses sell at about Rs. 12 the khandi (20 kuros), so the extra crop is worth about Rs. 7 an acre, or deducting seed and expenses about Rs. 3. If the irrigation has not been very good, and there are no winter rains, the second crop will not give much more than the seed; but the plants are also valuable as fodder.

(2) Irrigation will render poor black soil now growing juari or precarious crops of linseed capable of growing rice with an after-crop of one of the pulses, and in the case of red soil good rice may be substituted for the lesser millets or the most inferior kinds of rice.

The value in good black soil may be a question of doubt, but to my mind rice with a second crop is more valuable than wheat in Bhandara, where in a good year wheat does not give more than five to six-fold of the seed.

Crop experiments for many years are not available for comparison, owing to a difference of soil classification before and after Settlement, but I collected a certain number for Settlement statistics, and these give for *sihar* soil—

Unirrigated	1,313 lbs. to the acre.
2nd class irrigated	1,647 „ „
1st class irrigated	1,823 „ „

and for *morand* soil—

Unirrigated	1,326 „ „
2nd class irrigated	1,707 „ „

The first class irrigation experiments in *morand* work out to rather less than those of second class irrigation, but seem to include a large number of poor crops.

I have omitted very bad crops, and thus in a normal year the difference may be taken to be about 400 lbs., worth about Rs. 5 an acre.

In a year of scanty rainfall the outturn of unirrigated rice would fall to about 800 lbs., and that of irrigated rice to 1,300 or 1,500.

In a year of drought unirrigated rice yields practically nothing, say, on the average, 100 lbs. or less, as many fields yielded nothing and some crop experiments in 1899-1900 gave 200 to 300 lbs.

Irrigated rice fields in such a case give 1,000 to 1,500 lbs. according to the completeness of the protection.

25. Q. The too late commencement of the supply of water is a minor evil if a full supply is obtained later on. It may mean the loss of the seed, but if the ground gets enough water by the end of July for transplantation, there is still time for the crop to be re-sown to come to maturity. The early cessation of the rains is most serious, as was seen in 1896-97, where there was good early rain, but a rainless September brought about a famine.

26. Q. In 1896-97 in a very few cases water from wells was given to the rice crop, but it is very unusual. In Bhandara I do not know of any case either where water to the same sugarcane is given both from wells and tanks, though both systems of irrigation of sugarcane are in vogue. In one or two villages where water is obtainable by lifts from streams as well as from a tank, both sources of supply may perhaps be used for the same land.

27. Q. In a normal year the increase in produce from irrigation would add a khandi (400 lbs.) to the acre, value about Rs. 5.

In a year of drought the extra produce is about 900 to 1,400 lbs., value Rs. 18 to Rs. 28 an acre.

28. Q. There is no custom in Bhandara of paying a separate water-rate for the irrigation of rice, except in one or two villages, where the tank belongs to a cultivator who gives water to other tenants. I think in such cases the rate paid is about a khandi of rice, worth Rs. 5, for irrigating land in which one khandi is sown, i.e., about 2½ acres; usually this irrigation is not very good, but the rate is paid only on the area actually irrigated. In the majority of cases the water-rate is included in the rent. According to the soil factors employed at the late Settlement, first class irrigation adds about Re. 1 to the rent per acre and second class irrigation Annas 8 to Annas 12.

This extra rent is paid annually on the whole area classed as irrigable, whether it is irrigated or not.

Government receives ordinarily 50 to 60 per cent. of this increased rent, as it is included in the village assets. If the tank is a recent improvement, i.e., if made since the previous Settlement, no extra rent is assessed for irrigation, if the tank has been made by the cultivator of the land. If the tank has been made by the proprietor of the village the extra rent is assessed upon tenants who get water from it, but the extra rent so assessed is omitted from the total village assets on which the assessment is based. The *malguzar* gets the whole of it.

29. Q. The expenditure for bringing water to the land is usually nominal. Probably the tenant as a rule digs the smaller channels, the landlord the main channels; but this depends a great deal on circumstances. The money spent would always be recovered by the improvement in the crop as, when land is recorded as irrigated, the landlord is bound to supply water if it is available, and if it was not recorded as irrigated, i.e., if the tank was a new one, the tenant would naturally not make any expensive channel without a contract for an annual supply.

30. Q. The custom in Bhandara which has been embodied in the *Wajib-ul-arz* in order that it may not fall into disuse, is that the owner and the persons getting water combine in all minor repairs that recur annually, while the owner does the greater repairs, such as throwing earth on the *bund* as it subsides. Silt clearance, if it was done on a large scale, would come under the head of a major repair, but I have never heard of it being done, except in connection with throwing the earth removed upon the *bund* to heighten it. I cannot give the approximate cost of annual repair per acre irrigated. It depends much on circumstances, and much is done by the tenants themselves. It would not come to more than a few annas per acre.

I think the system works fairly well. No doubt tanks are often allowed to get into disrepair, but now that there is an entry in the *Wajib-ul-arz* which can be enforced, a little care and attention on the part of Executive Officers is all that is required; legislation would be of doubtful value. It would be difficult to legislate for such varying circumstances as exist; and imperfect legislation, by setting aside custom, would be worse than useless.

31. Q. There is a healthy public feeling regulating the supply of water; generally it is arranged by custom, and the owner of the tank, even though he be *malguzar*, cannot override the general feeling of the village. Disputes seldom arise when there is sufficient water, but in a year of drought of course all want the water, and if it is doled out to all, it would not be sufficient to save the crop of any. In Settlement, too, I often found small disputes as to whether a field was actually entitled to get water or not. This was a question of fact, not of principle; sometimes the dispute arose from a private quarrel owing to which the supply was discontinued; or it may be water was given in one year when the supply was plentiful and the cultivator wished to make this a precedent.

Now all the fields which can fairly claim water have been entered as irrigated in the record-of-rights, and in a year of normal rainfall these can claim to get water.

I doubt if Government assistance would be of much value. A little pressure can be brought now and then on a *malguzar* who disregards the record-of-rights when the body of the villagers agree that he is withholding water that could and should be given; but after all the owner of the tank knows by experience how much can be efficiently irrigated without uselessly frittering the water away to outlying fields, far better than a revenue official who comes once to

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the village; and unless the main body of influential tenants is against him he is probably in the right.

32. Q. As said in answer to the fourth question, I think the grant of land on a certain percentage of the Land Revenue in perpetuity would have a very marked effect in the encouragement of the construction of large tanks. The idea is not my own, but when suggested to me by Mr. Sly it at once struck me as a scheme that would appeal very fully to the people. They would not really get much more by it than by our present system of exemption for improvement, but the distinction attaching to the name *muafidar*, together with the feeling that their names would be remembered for ever as the makers of the tank by the existence of the grant, would operate much more on men's minds than the mere probability of some material advantage for a few years.

I certainly think every encouragement should be given to private persons to make tanks, as I fear that the management of tanks made by Government, unless of the very largest size, would be accompanied

with innumerable difficulties and considerable expense.

33. Q. The silting up of tanks has never been put before me as a very practical difficulty. The silting up is not of great importance in those tanks which are yearly drained dry, as the greater part of the silt is carried out by the water. The usefulness of one very old tank at Pauni has been impaired by silt, and the town tank at Chanda was a good deal reduced in depth, so that the clearing away of the silt was taken up as a famine work.

Irrigation from wells is not of great importance in Bhandara, though in some parts there is a good deal of irrigation by lifts from streams. I have not made any special enquiries into this subject, but I know that such land commands a higher rate than irrigated rice land and practically an equal rent with sugarcane land irrigated from a tank. There must be more expense in irrigation, but the tenant no doubt recoups this by being master of the irrigation—getting water when he wants it. There is not much room for extension.

1 Q. (The President).—You have been for some years in this province?—Yes; since 1889.

2. Q. Have you been through the famines here?—I have been through both the famines in 1896-97 and in 1899-1900. In the first I was Settlement Officer and I had very little to do with the actual famine, though I saw a good deal of it. In the second famine I went away for three months from my district, where I was doing settlement work, to Chanda and started famine operations there.

3. Q. You say in page 1 of your memorandum, in answer to paragraph 4 of question 3, "A few tracts of level black soil are embanked and not otherwise irrigated, but this is probably due not to unsuitability to irrigation but to the non-existence of sites for tanks." Is embanking pretty common in Bhandara?—There are three main portions where embanking is generally done. There is one at Powni-Chauras, which is between the Wainganga and a small tributary; another the second in importance, is in the Rampaili pargana, which is between the Wainganga and the Chuni; and the third, where the embankment is not nearly so good, is, more or less, between the Sur and the Wainganga.

4. Q. Is this due to the fact that the physical features of the place render facilities for embanking which are not found elsewhere, or is it due to mere local custom?—Mainly due to the fact that it is black soil. At the same time there is one other wheat-growing tract, in the east of Bhandara, where embanking is not found.

5. Q. Do they use tanks?—In the middle or more or less on the borders of Powni-Chauras, at a village called Chauras, there is a small tank for irrigation. They irrigate rice and not wheat. Where they had a little bit of catchment area they have made a tank.

6. Q. This country is not well adapted for tanks?—No. It is almost a level plain.

7. Q. At the head of page 2 in reply to question 4 you allude to a suggestion made by Mr. Sly, "that the area irrigated from a large work should be given to the maker for ever on a quit-rent varying with the land revenue in perpetuity"?—Yes. I mean if a man made a tank in his own land he should be given what, in native custom, is called *Tukm*.

8. Q. What is that?—It is a grant made of the area irrigated by tanks with very often some extra area of waste land and it is given on certain privileged terms in perpetuity. These *Tukms* were granted chiefly under the Gond Rajas of Chanda.

9. Q. Do you mean a permanent settlement?—Not a permanent settlement, but a privileged settlement varying with the land revenue as it was altered from time to time, with the title of *Muafidar*. If the full revenue was Rs. 100, you might give it to the man at Rs. 60. If at the next settlement, owing to rise in prices, the revenue was increased to Rs. 150, you would give it to him at Rs. 90. Mr. Sly suggests that we should give the man, in addition to the remission of his revenue which he gets at present under our improvement rules, a complimentary title of *Muafidar*, which is always valued.

10. Q. On page 4 you mention among the tanks one at Palasgaon capable of irrigating about 845 acres; that is a large tank; whose property is it?—It is rather hard to say. There are a number of villages having the same name. I believe this is the private property of the zamindar of Palasgaon. The tank was made recently.

11. Q. Was it made to water the zamindar's own land?—It waters his tenants' land. That, I think, is a *malguzar's* tank.

12. Q. If a man has a large tank like that it involves a certain amount of maintenance: how is this provided for?—I have said in answer to question 30 on page 6: "The custom in Bhandara, which has been embodied in the *Wajib-ul-arz* in order that it may not fall into disuse, is that the owner and the persons getting water combine in all minor repairs that recur annually, while the owner does the greater repairs, such as throwing earth on the bund as it subsides."

13. Q. What is the *Wajib-ul-arz*?—Village administration paper, which is a paper recounting village customs. It contains a large number of matters, such as rights of way, etc.; it has a large number of stock clauses.

14. Q. It is an official document?—Yes; it is an official document which the proprietor of a village signs at the time when the settlement is made. He is bound by this paper. At the same time the Government has power, under a provision of law, to enforce any clause in the *Wajib-ul-arz*; and if the proprietor does not obey the customs therein laid down, he can be fined for his disobedience.

15. Q. Is it a usual institution in the Central Provinces?—The village administration paper is a concomitant of the settlement of lands. It is always attached to every settlement.

16. Q. You say in reply to question 30 on page 6, "No doubt tanks are often allowed to get into disrepair, but now that there is an entry in the *Wajib-ul-arz* which can be enforced, a little care and attention on the part of the executive officers is all that is required." Is it a recent thing—you say now that in *Wajib-ul-arz*. It is a custom which I found out from the general evidence in the country and the Chief Commissioner sanctioned its insertion in the *Wajib-ul-arz* at the late settlement.

17. Q. Suppose the zamindar of a village is at variance with his people and they decline to clean his tank or repair the bund, what pressure could he bring to bear upon them?—I imagine he would not give them water next year. That is probably what would be the real outcome. Anybody who did not take a legitimate share of the repairs would probably get less water next year.

18. Q. Would there be any appeal on his part or on their part to the Courts?—I cannot say if it would go before the Civil Court. It would go before the Revenue authorities. The Deputy Commissioner would see that justice was done in the matter. It is hardly definite enough to go to a Civil Court in my opinion.

19. Q. Practically, are repairs well looked after?—Many tanks are in very good repair indeed.

20. Q. This is a most burning question in the whole of Southern India where there are thousands of tanks. The question has arisen how they are to be maintained. The old system of statute labour has died out and there is nothing else to be introduced in its place?—I can only speak of my particular district. There is a great deal of forced labour called *begar* which is not legitimized in any way. As a matter of fact, every tenant of a *malguzar* has to give so many days' forced labour. On the whole where a *malguzar* is a careful person he keeps his tank in fair repair. I do not say in the best repair possible. When a *malguzar* gets into debt, or is a careless culti-

vator or is non-resident and does very little cultivation himself, then it very often happens that the tanks get into very bad repair.

21. Q. This is very different from what we have seen elsewhere in India. Except in the Central Provinces, we have not yet come across any great number of private tanks. They are all practically public tanks.

Mr. Muir-Mackenzie.—The tanks in zamindaris in Madras are private property. We heard that zamindars kept them in bad repair and the question of putting some pressure on them to do the repair was also mooted.

Witness.—Here it is their own property and it is to their advantage to see that the tanks are kept in proper repair. Some of the tanks in Bhandara are magnificent sheets of water.

22. Q. To go back to question 5 on page 2, you say in answer to it, "Loans for the extension of irrigation were always freely taken." Were these generally for tank bunds or for wells?—Generally for tanks and to a small extent for the embanking of lands. When I say tanks I mean what they call *boris* or little ponds, where the supply is very often not enough for more than an acre.

23. Q. I suppose they are useful for cattle for drinking purposes?—No. They do not keep water long enough to be of value in that way. It is, however, useful in this way, that it gives enough water for transplantation and small tenants sometimes take advantage of it. Very often they would not be bigger than this room.

24. Q. You go on to say that there are a good many difficulties, such as long delay in getting sanction, &c., and you recommend that loans should almost invariably be given by the Executive Officers on tour. Do you include under "Executive Officers" Tahsildars or merely Deputy Commissioners and Assistant Commissioners?—Selected Tahsildars are often as good as Extra-Assistant Commissioners. I am mainly thinking of European officers.

25. Q. You don't mention wells?—There are very few wells in Bhandara. I say at the end of my Note: "Irrigation from wells is not of great importance in Bhandara, though in some parts there is a good deal of irrigation by lifts from streams." There are parts where there is irrigation from wells; in the *kachhar* lands on the banks of the Wainganga I found a great deal of garden irrigation from very shallow wells indeed—*kachcha* wells, just dug for a year. Otherwise irrigation is generally from streams which may not run all through the year, but which have a good deal of water under the surface. Pits are dug and the water is brought up the bank of the stream. Most of the sugarcane in Bhandara is for instance irrigated from the tanks.

26. Q. Tanks used for sugarcane never fail?—Not often.

Q. (Mr. Muir-Mackenzie.)—Did not the tanks used for irrigating sugarcane fail in 1899-1900?—They had to reduce their area.

27. Q. The tanks did not altogether run dry?—I would not say none did; but a great many did not.

28. Q. At any rate the bulk did not?—Yes.

29. Q. (The President.)—At the top of page 3 in reply to question 6 you say: "Everyone in Bhandara is agreed that there is much scope for increase in irrigation and strongly desire that it should be increased." As they are used to small tanks, they do not contemplate large storage of water?—No.

30. Q. Do you think that these small tanks are of any value in times of serious drought?—Small tanks are not really protective as they would only protect a small area. I mean you get a four-anna crop if you get one watering so late as the end of September out of them—not over the full area that might be generally irrigated, but over a fair area.

31. Q. You say in reply to paragraph 3 of question 23, "Rice tanks are only required to keep water till December." Don't they go in for a second crop of rice?—Never. I have never known a second crop of rice in Bhandara. They grow generally pulses as a second crop to rice.

32. Q. In reply to question 24 on page 4 you say, "Irrigation enables a second crop to be grown in soils of fair fertility." What does the second crop consist of?—Generally *lakhori*.

33. Q. All rabi crops?—Yes. You have gram, linseed, sometimes *urd*. They very seldom grow wheat after rice. I do not say they never do it, but it is seldom the case.

34. Q. Do the owners of these tanks ever bank the streams so as to increase the catchment basin and make the supply more permanent?—The large tanks which are used for sugarcane cultivation are very nearly always banked across small nalla beds. Some tanks have an embankment across a stream which they call an *ulta*, by which they turn the water from the stream and they do not irrigate from the embankment itself but they carry the water from it into other tanks.

35. Q. Is sugarcane largely grown?—I am afraid I have not got any statistics. It is not largely grown, I would say. Most of the sugarcane is of a poor kind—sugarcane called *kathai*—which is not very valuable for producing *gur*. The difficulty really is the damage done by the jackal and the pig. This *kathai* is hardly sweet to the taste of an animal. It is as sweet as a bramble shoot. Good sugarcane is grown to a certain amount by some *malguzars*.

36. Q. Do they know how to crush it and get *gur* out of it?—They have their ordinary presses or mills. The wooden press is the rule. One *malguzar* has got an iron press.

37. Q. What do you think is the best form of relief works?—The easiest controlled is road work; but it is not the best for the country.

38. Q. What would you say is the best for the country?—Irrigation works for rice tracts, and I think a great deal might be done in the way of embankment of land for wheat. My scheme, which I started (I do not know if it really went on after I left Chanda), was to have everybody on the road work for a test, because the stone work is an unpleasant form of labour. When we found that the road work was getting too troublesome or that the numbers were too great, we drafted them on to repair or make new tanks or embankments.

39. Q. The tanks which you were repairing being private property?—Yes.

40. Q. Does the owner pay anything for it?—No.

41. Q. It is a great help to him?—Yes; but we get it back in the shape of rent.

Mr. Craddock.—Some day?—Yes. But we do not get anything back from the road.

42. Q. (Mr. Higham.)—From your reply to question 6, I infer that people and perhaps you yourself are of opinion that it is much better to get *malguzars* or private individuals to make tanks in Bhandara than for Government to make them themselves?—There is, no doubt, a great scope for some very large tanks in Bhandara, which would, in my opinion, be only possible if made by Government—works which will provide water for a large number of villages. These must be made by Government, if they are made at all. But I do not think it would pay Government to make a tank to provide only for one village. The supervision would be difficult and you will have a lot of minor inconveniences of low-paid officials wandering about in the village worrying people. It is better, I think, if the work is to be used merely for one village, to get it done by the village itself.

43. Q. In what way will it be possible to encourage the construction of such tanks?—By granting *takavi*.

44. Q. In your Bhandara District, have many new tanks been made during the past few years?—A great many.

45. Q. By private men?—Yes.

46. Q. Can you say how many?—I am afraid I cannot say that. But I know from my work as Settlement Officer I had to allow for all improvements made since the settlement, and I would ordinarily get, in a fairly big village, applications in regard to ten or fifteen small tanks or *boris* which are claimed to have been made during the last 30 years.

47. Q. Is that process still going on?—Yes.

48. Q. Have there been any improvements since the last famine or in consequence of the late famine?—I have not been there since the last famine, but have been between the two famines. I certainly saw some improvements.

49. Q. You mention that a good tank was made by Mr. Buti in Managarh. Is it an instance of that?—That was made before the famine. It was improved very much in the famine of 1896-97. He is a money-lender here and has got a number of villages as well.

50. Q. Was the tank made to supply several villages?—No, only for one village.

51. Q. Wherever sites can be found *malguzars* are quite willing to come forward to make tanks?—

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Generally. Of course men who are indebted could not do it.

52. Q. Does it depend on the Settlement Officer or the Public Works Department Officer offering suggestion as to sites?—Not to a great extent.

53. Q. Cannot they start them themselves?—Yes, but they want a little bit of waking up.

54. Q. Do you think that any more liberal terms are necessary than are now given?—In my memorandum, I have stated that grants-in-aid might be given when a tank or well is required for drinking purposes as well as for irrigation and the village is too poor to contribute anything.

55. Q. Would you advance money at a lower rate of interest than you now do?—I do not think it is necessary.

56. Q. You do not think it is necessary to give a longer time for the recovery of advances?—I have not heard complaints. My only point with regard to repayment is that remissions should be made of a certain part of the loan, if the tank burst in the first year. It is not always possible for a cultivator with his poor knowledge to align his tank in the best way possible or to allow for proper waste weirs. When the earth is not consolidated, it very often breaks the first year. This means a very large loss to the cultivator.

57. Q. Do you think it is desirable or necessary to provide or offer expert assistance in designing these tanks?—Not for small tanks. Of course there are mistakes occasionally.

58. Q. It is better to leave the people to find them out themselves?—I think so.

59. Q. If they make mistakes?—It would really cost Government less to give them a remission than to give them expert advice, which would, probably, not be taken when given.

60. Q. If there is an opening for the construction of small tanks of that kind, could they be put down in the relief programme for the employment of famine labour?—We have a system of village famine notebooks in which projects of this sort are noted, and it is supposed that these books should be taken out by the executive officers in camp and when they see a fair site they should note down the fact in them.

Mr. Craddock.—That is abolished now. Instead of that, they are to make detailed inquiries.

61. Q. (Mr. Higham.)—Suppose you employed relief labour for making private irrigation works, would you expect any contribution from the landowner concerned?—You mean when they are made as famine works?

62. Q. Yes. Would you expect a contribution from the people in whose behalf they are made?—Probably it would pay better not to take anything until the next settlement and then to take the extra revenue which you would get by wet rates.

63. Q. Has relief labour been employed at all in making private works of that kind?—Tanks have been repaired, but whether new tanks have been made or not I cannot say.

64. Q. There are a great many tanks throughout the province—30,000 I think?—The number of tanks in Bhandara is given as 18,000, but these include very small ones.

65. Q. Does the Government ever do anything in the way of assisting people in the maintenance of these tanks?—No, except by timely advice and a little pressure.

66. Q. Is it not the case that many of them fall out of use in time?—They seldom fall out of use. They sometimes get into disrepair, but not to any very great extent.

67. Q. Does not the Government construct the masonry works and sluices?—As a rule these small tanks have no masonry works.

68. Q. You think that the Government might usefully spend money on giving them outlets and making them a little more serviceable and permanent than they are at present?—I do not recommend Government interference in these small tanks. I think that if Government were to begin to interfere, it would cause a great deal of friction in the village, and I do not think that the gain would be commensurate with the disadvantages.

69. Q. A great deal of revenue depends upon them?—The revenue is collected whether the tank is repaired or not. It is only when the tank gets into such disrepair that the village deteriorates, that the revenue will be affected. As I have pointed out in my answer to question 30, the way in which we can

make a man repair his tank is by fining him, and the money so recovered could be spent upon its repairs if he does not carry them out.

70. Q. Your reply refers to minor repairs?—No, not altogether. The landlord is bound to carry out greater repairs. The landlords and the cultivators together are bound to carry out minor repairs.

71. Q. The landlord is responsible for greater repairs and the cultivators and landlords for minor repairs. Is that so?—Yes.

72. Q. And the Government spends nothing on them?—No.

73. Q. You don't think it should?—No.

74. Q. In cases in which large tanks are made for the benefit of several villages of the kind that Mr. Harriott proposes, do you think that it would be possible to realise the rate of Rs. 2 throughout, that is contemplated?—To take a rate of Rs. 2 over a very large area has never come in my experience. I know that people do pay larger rates than Rs. 2 for irrigation; sometimes they have to pay Rs. 4 or Rs. 5; Rs. 2 an acre is the recognised rate paid in grain in a few cases that I know of.

75. Q. That is when water is taken when wanted?—They practically do pay every year. Water is always required for growing rice except in the most exceptional cases.

76. Q. I suppose for wheat cultivation you could not get that rate every year?—I do not know what rate you could get for irrigated wheat cultivation. I have never known wheat to be irrigated.

77. Q. The 2-rupee rate would apply to rice only?—Yes. I should imagine that it would be much less for wheat, but I cannot say anything definite as I have no data to go upon.

78. Q. What would be the maximum amount of loan that may be advanced for tanks and so on? We heard that it was three years' revenue. Is that so?—I am not quite sure of the exact details. I imagine that it is ten or twelve times the revenue for a malguzar, eight times for an absolute-occupancy tenant who could sell his holdings, somewhere about six times for an occupancy tenant, and three for an ordinary tenant. I think that is right, but I cannot be sure. I have been doing settlement work and not *takavi* work for the last five years. I am a bit rusty about it. There is a circular on the subject, which will tell you exactly what the time is.

Mr. Muir-Mackenzie.—What amount of benefit did the district receive from the irrigation of tanks in the famine of 1896-97?—That is best gauged by a comparison of the Balaghat District with the Bhandara District, because the Bhandara District is better irrigated in the Sakoli part, where there were crowds of immigrants from Balaghat all the time I was working there. The Sakoli is the best irrigated part of the district. There was distress but no famine in 1896-97 in the Sakoli Tahsil.

79. Q. I see from the figures, that the irrigated area in the Bhandara District was up to the average in 1896-97?—I dare say that was the case. I am afraid I cannot say from memory.

80. Q. Assuming that to be the case, was the irrigation as full as usual?—No.

81. Q. What crop did they get?—In Sakoli they certainly got 12 to 14 annas on the irrigated area. The unirrigated area suffered more. There is a great deal of unirrigated rice in Bhandara.

82. Q. How was the crop on the unirrigated rice lands in that same tract?—About 6 annas.

83. Q. That means it was an appreciable crop?—Yes; I made some crop experiments with unirrigated rice.

84. Q. Was not the rainfall better than the average for the province?—I cannot say exactly.

85. Q. I want something very rough. I don't want the exact figures?—In 1896-97 rain came in early, so that tanks were filled, and a certain number of them even burst.

86. Q. The cultivators in the district did not husband the water but let it go, having had previous rainy years?—I imagine they kept as much as their tanks could hold. I do not see why they should let it go. Considering that the tank water is never good enough for rice, they have to depend upon rain water and the tank supply is given to the fields at intervals. If a man gets one watering, his fields may have to wait for three weeks before they get their turn for another watering.

87. Q. Would it be safe to assume that from villages well supplied with tank irrigation for rice, nobody went on to relief works?—Labourers might have gone, but I do not think that any of the cultivators went.

88. Q. You cannot hazard an opinion whether the tanks in Sakoli were better filled than in other parts. Can I take it as a typical area or is it a tract better situated?—Probably it has a little better rainfall.

89. Q. Is the supply of tanks more assured there than in other parts?—Yes.

90. Q. The whole of Bhandara collapsed just as much as any other district in 1899-1900?—Yes, but the condition of the villages was very much superior to that of adjoining villages in Balaghat.

91. Q. In what state of development is Bhandara?—Is it generally forward or backward?—The northern tahsil, Tirora, with a small part of Balaghat which adjoins it, is probably the best rice-growing tract in the province. Powar cultivators are the best rice cultivators.

92. Q. You have no specially backward parts in the district?—Yes.

93. Q. Is there much good in extending irrigation there; will they take water?—They will always take water. The zamindars have a very poor idea of giving water to cultivators. They keep water in the tanks for themselves.

94. Q. What do they do with it?—They use it for their home-farms. They do not want tenants to get the right to take water.

95. Q. Are you in favour, Mr. Napier, of going further than at present in the matter of exemption of improvements from enhancement of assessment?—There was that suggestion that I spoke of before and which, I think, might encourage them to make big works.

96. Q. You mean the system of making men muaf-dars?—Yes.

97. Q. Apart from that?—Apart from that for small works the present rules are quite sufficiency.

98. Q. Do you think people understand them?—I cannot say that they do thoroughly.

99. Q. Do you consider that the present provisions regarding the exemption of improvements from enhancement of assessment when the time came for it might be more liberal than they are?—For big tanks, some arrangement might be made for allowing men to hold on quit-rent varying with the land revenue in perpetuity. But for small works, I think the present rules are sufficiently liberal. The loss of revenue from granting permanent exemptions would not be very great, if the annual increment due to improvement was not taken into account. It would cause great discontent, if a man, while he was paying Rs. 10, had got a *sanad* saying that his rent was not going to be increased on account of improvements, was told that he had to pay Rs. 15 not on account of improvements, but because his neighbour also paid at this rate and he had been all along paying a lower rent.

100. Q. Would not a tenant understand that he was paying only dry rate instead of a wet rate, suppose he is paying 12 annas an acre and it is enhanced to 14 annas, the ordinary rate for irrigable land being Rs. 1-8-0; would he not see the difference between 14 annas and Rs. 1-8-0?—Yes. But it does not work out quite so simple as rates per acre. Under our complicated system, it would be difficult for him to understand what exemption he was getting for improvements.

101. Q. One reason that he does not understand it is that his rent is settled on his holding?—Yes.

102. Q. Does he not understand how his rent is composed?—He does very often, I own; but he does not sometimes. If you get a Gond, he could not possibly understand it.

103. Q. Can you tell me what is in practice the actual period of repayment for *takavi* loans?—That depends on the amount of work done. If a man takes Rs. 50 he repays it in three years.

104. Q. I understood you to say that if a malguzar refused to repair a tank, the only thing to do is to fine him?—Yes; to fine him, after a certain amount of revenue pressure.

105. Q. Would the revenue pressure or the influence, as you may call it, be enough to induce him to repair a tank?—Yes, if he has the money.

106. Q. Has it ever been thought possible to refuse him the power of recovering rents from his tenants who are damaged by the tank being out of order?—

Under the law as it stands at present, a tenant could get a reduction in rent on that ground.

Mr. Craddock.—The new Tenancy Act of 1899 provides for it.

Mr. Muir-Mackenzie.—You have no such provision as landlords recovering their rents through Revenue Courts?

Mr. Craddock.—They can through Civil Courts.

Mr. Muir-Mackenzie.—Then all the provisions of the Civil Procedure Code apply?

Mr. Craddock.—Yes.

Mr. Muir-Mackenzie.—No summary method?

Mr. Craddock.—No, except for plot-proprietors.

Mr. Muir-Mackenzie.—Is there anything like a crying grievance that malguzars do not repair their tanks?—Individual cases, yes. Many cases, no. Generally, it is in the case of absentee landlords.

107. Q. Do you not think that in the case of absentee landlords it would be better to have some more stringent provisions at your command, so that if you had a complaint from the village you might be able to reduce the rent?—The Deputy Commissioner might tell the tenants to come up and apply for a reduction of rent.

108. Q. Under the Civil Procedure Code?—No, before the Revenue Officer.

109. Q. Do you think that any attempt to extend well irrigation will be thrown away in Bhandara?—Yes, on the whole.

110. Q. Is it because that they prefer tanks?—Yes.

111. Q. Don't you think that it would be a valuable thing to build wells near the tanks as a protection in time of drought?—It would take a very long time for the people, to realise their utility; and I do not know whether the protection obtained in one or two years of famine would pay for the expenditure on the wells. It might be really a good thing, but they would not lay down Rs. 100 or 200 to make a *pakka* well on the chance of a famine coming ten years hence.

112. Q. You do not think that with the remembrance of famine fresh in their minds you could get some of them to take up the question very energetically?—I do not know that it would be really valuable.

113. Q. Could they not raise more valuable crops in ordinary years; could they not, if wells were put underneath their tanks, raise second crops?—They raise second crops as it is under tanks.

114. Q. Would they not raise more valuable crops; it is done to an enormous extent elsewhere. The areas underneath the tanks in Madras and Mysore are covered with wells?—I have never seen them.

115. Q. You think it is quite hopeless to encourage the practice?—I don't say that. I have never heard of the practice and I cannot on the spur of the moment realise the effect. I dare say you can grow sugarcane under a tank in that way as there would be sufficient water to irrigate sugarcane all the year round.

116. Q. Knowing that these tanks would dry up in another year like 1899-1900, would you be prepared to say that Bhandara should have more wells than it has?—I have seen such little use of wells, having never been in a well country, that I cannot give a proper opinion as to what wells could do in Bhandara. There is a great deal of rock underlying the surface.

117. Q. Is there difficulty in getting water?—Very often it is hard indeed to get drinking water for villages. In Bhandara, which is quite close to the Wainganga, wells ran dry in famine years.

118. Q. Did they generally do so throughout the district?—In a good number of places they did so.

119. Q. Do you consider that the sub-soil water is so low that they could not get water?—You get down to rock so soon.

The President.—Can't you go through rock?—They sometimes go through it.

Mr. Muir-Mackenzie.—What is the rock?—Sandstone and laterite.

120. Q. (Mr. Rajaratna Mudaliar.)—Apart from the patriarchal pressure that you apply to malguzars, do you think that any practical inducement to construct and provide tanks could be given in the way of exemption from enhancement of revenue for a term of years?—There are regular rules by which it is done.

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121. Q. For what term do you grant exemption?—To give you an idea about it, it is best to take a concrete instance. A malguzar, let us say, constructs a tank which irrigates 50 acres which were not irrigated before. Until the Settlement Officer comes round, he probably charges a separate rate for irrigation in addition to the rent. That is generally what is done. He might enhance the rent and he would get that enhanced rent as profit up to the next settlement. When the Settlement Officer comes round, the new rates of rent charged from the tenants would be calculated at the wet-rate. Suppose they paid Rs. 50 before and now they pay Rs. 80, the difference of Rs. 30 will be the increase. That sum of Rs. 30 would then be deducted before we add up his assets for the purpose of assessing the revenue. We would deduct that sum which has been added to his assets by the construction of the tank before his revenue was assessed.

122. Q. That is for the next settlement?—Yes. After that, unless there are the special orders of the Chief Commissioner, he would be assessed on the whole amount. But the Chief Commissioner may, under the rules, extend the period for a longer time.

123. Q. What is your usual period of settlement?—Twenty to 25 years is the proposed length of settlement as soon as the settlements are placed on a proper basis. There are some short-term settlements going on now for seven or eight years; but 20 to 25 years is the period which is being aimed at ultimately.

124. Q. So that he will get exemption, in order to recoup himself of the outlay, for about 20 years, that is till the next settlement?—Yes, it will be the balance of current settlement and the next settlement. It may be 40 years or only 20 years, or it may be some period between the two.

125. Q. Do you think that it will encourage the construction of private works if the period fixed were extended to 30 or 40 years? There is at present a sort of uncertainty owing to short-term settlements. Do you think that it would encourage the construction of private works if the period is extended?—It would, to a certain extent; but it would cause a great deal of inconvenience. When it comes to the question of assessing the revenue, he will have two kinds of settlement going on. They will have to worry him with another settlement. There is the period to be counted after the settlement and they will have to go into the question as to how much he is to be assessed. Practically they will have a second settlement. Considering all this, I do not think he would feel that he got any concession at all.

126. Q. I do not suppose that as a Settlement Officer you would be heaping up the past arrears in the settlement?—No. But there will be the inconvenience and worry. I have been a Settlement Officer and I know that a settlement is a great worry to the malguzar. He has got rid of it once, but to put on a settlement to find out how much more he would have to pay ten years later would cause him a great deal of worry. I think he would suffer.

127. Q. (Mr. Muir-Mackenzie.)—It is not necessary to put on a Settlement Officer?—It is not so much the Settlement Officer that he is afraid of as the Settlement Officer's *amlah*.

128. Q. (Mr. Rajaratna Mudaliar.)—In Bhandara there are 5,421 tanks in the khalsa villages? I am taking the figures from Mr. Harriott's Tables.—I am not quite sure of the numbers which are shown in that statement. The number 17,743 which I have given includes tanks and ponds, from the largest to the smallest.

129. Q. Mr. Harriott's number is less?—Yes. I probably include a large number of very small ponds. Everything which is shown as irrigating land is included in my figures.

130. Q. Even taking the number to be half of that figure, viz., 8,000, don't you think it would be good policy to encourage the construction of wells in wet areas to supplement the irrigation from tanks?—It is a matter which I have never considered. I have not got any data to go upon. I dare say it may be very valuable, but I do not know if it will be of value where you find rock. The soil in Bhandara is sandy, a sort of mixture between clay and sandstone. I doubt their being able to get water without going to great depths.

131. Q. Is blasting ever practised?—Yes for drinking wells. I think there must be something in the rock close to the surface which prevents people from getting much of the sub-soil water. Otherwise there would be more wells. There are curiously few wells

in Bhandara. It may be due to ignorance on the part of the people as to their value.

132. Q. In fixing your rents upon the total of holdings, do you not distinguish irrigated from unirrigated land?—We do in my district. I had a dozen different kinds of soil and 20 different positions for them. What I mean to say is, for instance, with regard to rice lands we divide them into three kinds of dry land—on hill, on level or in a jhil or low position. There are two kinds of irrigation—the first class and the second class. We distinguish garden lands. There are six kinds of irrigated garden lands, whether it is irrigated from a tank and growing sugarcane or vegetables, or whether it is irrigated from a well or by lift from a stream and growing any vegetables. Then there is another kind of irrigated land on the banks of streams.

133. Q. If you can go into these elaborate calculations, what difficulty will there be in making the ryots understand, in cases where exemption is granted for a term of years, that the total enhancement in the assessment at the next settlement did not take into account the increase due to improvements? That is what you said in reply to Mr. Muir-Mackenzie's question?—The point is that the classification is so elaborate that the very elaboration makes it difficult for the ryots to understand it.

134. Q. It is much more elaborate when you go to the classification of each field?—You may get one field which may have four or five different kinds of soil in it.

135. Q. With our system of field classification in the Madras Presidency, ryots do understand that they are exempted from enhancement of assessment under well irrigation. What difficulty do you experience in enabling them to realise that there will be no enhancement?—They do not understand it. You can say to him: "Your rent would have been Rs. 20, but on account of improvement I have exempted you from paying Rs. 4. You are at present paying Rs. 12, and it might have gone up to Rs. 16, but it is now raised only to Rs. 15." He at once says: "I have improved my fields and yet my rent is raised from Rs. 10 to Rs. 15." That is where the difficulty comes in. It is all logically capable of being explained to him if he will only believe it.

Mr. Muir-Mackenzie.—Does a malguzar find it hard to understand his revenue?—A malguzar often thinks that he is being cheated. I have shown to him in writing that so much has been exempted, but he still complains.

136. Q. If he has a rent of Rs. 500 or Rs. 600, does he not see that otherwise it would have been raised to Rs. 750?—Yes. It is clear from our calculation how much exemption he has got.

Mr. Craddock.—Among the difficulties which you have experienced and which people experience in making small village tanks or substantial village tanks, have you come across instances in which the difficulty was one of the command of the land? That is to say, by making a tank some land will have to be submerged?—Yes, very often.

137. Q. Do you think it desirable to have some provision by which the land may be acquired under the Land Acquisition Act for the improvement of the village in the form of tanks?—Yes, but it ought to be safeguarded and very carefully worked. Occasionally you get cases where it is sheer dog-in-the-manger business. The man would not give the land because he thinks that he could get a better price by holding out.

138. Q. You commonly hear it said that tanks are not made as frequently as they were once. Do you think that this want of command has something to do with it?—Yes, it may have.

Mr. Muir-Mackenzie.—I see according to Mr. Sly's figures in regard to khalsa villages the number is given as 400,000. But you give it as 700,000. These figures do not agree because you include small *boris* in your figure. May one reply upon the fact that there has been a material increase?—In my five years, I have seen tank after tank being made. One man made a very big tank and I know that a great many tanks have been made during those five years. A couple of thousand would be well within the limit, including small tanks.

139. Q. Would you say that they irrigate 20,000 acres?—Not perhaps 20,000 acres of new irrigation. But very often there are subsidiary tanks to add a little to irrigation which had been defective before.

140. Q. Can you say 15,000 acres of new irrigation?—I should think so.

WITNESS No. 3.—The HONORABLE MR. GANGADHAR RAO MADHO, C.I.E., Landowner.

1. Q. (The President.)—You are a resident of Nagpur?—Yes.

2. Q. You own lands?—Yes; in four districts of this province.

3. Q. Have you suffered much from famines?—More in the late famine than in that of 1896-97. I have a large number of villages in Bhandara and Chanda Districts. That is the reason why I suffered most.

4. Q. With your knowledge of the Central Provinces and your own personal interest in the matter, it would be very useful for us to know what you think would be the right policy for Government to pursue to protect the country from the recurrence of such disasters as there have been?—I think if Government could build storage tanks whereby it would be possible to irrigate a large number of villages, that would enable Government to tide over difficulties. *Takavi* loans also may be advanced on more liberal terms to cultivators and landlords.

5. Q. For what purpose?—For making small tanks in villages. That would also go a long way to meet the difficulty. Thirdly, I would recommend assistance being given to tenants to enable cultivators to make embankments, because the greater the number of embankments that land has the less the number of bullocks that are required.

6. Q. For ploughing?—Yes.

7. Q. How do the banks save the bullocks?—Because the ground becomes soft. In districts other than those where rice is cultivated, I would recommend that *takavi* may be given for sinking wells. When applications are made for *takavi* professional advice as regards boring must be given by Government. I would also recommend that improvements should not be taxed as such.

8. Q. Never?—I would recommend that they should never be taxed, because these improvements secure the revenue to Government; whereas to the *malguzar* or the person who invests money, it is of course uncertain what he will have to pay by way of assessment. He has also to spend money for the repairs of these works. While he is held responsible for them, it is not certain whether the improvements he makes will always give him a sure return. A well may be dug and it may fail and may not be successful.

Mr. Higham.—In that case he would not be taxed?—But the people fear that he would be taxed.

9. Q. Are there any parts of the country where you would suggest large storage works and for what cultivation would you suggest them?—With regard to rice chiefly.

10. Q. In what part of the country do you think they would be most desirable?—I would recommend the construction of such storage tanks in Bhandara and Chanda. I have villages there.

11. Q. Do you know anything of Chhattisgarh?—I have not much knowledge of that part of the country.

12. Q. You propose *takavi* advances being granted both for small tanks and works?—Yes.

13. Q. Do *malguzars* avail themselves of the *takavi* advances largely?—I have reasons to think so. I think in the famine of 1896-97, when Government was kind enough to advance money on a more liberal scale and promise them some remissions, more *takavi* was taken than at other times.

Mr. Craddock.—There was a good deal of what we have heard called patriarchal pressure.

The President.—With regard to smaller tanks that you were talking of, up to what size should they be done by private resources and when should the Government step in? Can it be that Government should step in when a tank is to irrigate 100 acres?—I do not think the Government ought to step in in regard to tanks at all. But in the case of tanks which may irrigate 10 to 20 villages the Government might come forward.

14. Q. Would you say 2 or 3 thousand acres?—Yes, 3 or 4 thousand acres.

15. Q. Do you think that up to that *malguzars* should do it?—Yes, I think so—*malguzars* and big tenants.

16. Q. It will cost a good deal of money?—If a grant-in-aid were given I think they would embark on that enterprise, after advice.

17. Q. A grant-in-aid of Rs. 20,000 and that kind of thing?—I think that for small tanks Rs. 5,000 or 6,000 each would be sufficient.

18. Q. As a loan?—Yes.

19. Q. When you say that you would not charge afterwards, do you mean that the man should have permanent settlement afterwards or do you mean you would not charge him for the well? Suppose before he made the well he was charged dry rate and suppose that the dry rate was raised all round, would you not raise his dry rate?—Yes. The assessment charged on general considerations may be raised; but the improvements as such should not be charged.

20. Q. Always?—Yes, always.

21. Q. Would a *malguzar* understand it? Suppose when the settlement came round the officer said; I won't tax you for your tank, but I would tax you because the dry rate has been raised all round and you will have to pay Rs. 15 instead of Rs. 10. Would he understand the reason?—Some of them would understand it. They would compare their rates with those of the neighbouring fields and understand the difference.

22. Q. You would help the tenants to make embankments round the fields, i.e., the *haveli* system?—Yes. In Paoni Chauras, in Bhandara, that system prevails.

23. Q. Could that be done all over the Central Provinces?—There are many people who understand the benefits of this system and are gradually taking to it.

24. Q. Do you think it would be good policy for Government officers to encourage it all through the country?—Yes. Wherever it is possible to do it, it would be advisable to encourage.

25. Q. Will you give us your views about the irrigation of black cotton soil?—For rice purposes, I think the black cotton soil, if irrigated, requires a larger amount of manure than yellow soil. Yellow soil is better adapted for rice than black cotton soil.

26. Q. Black cotton soil is best for *juar* and cotton?—Yes.

27. Q. Is it good for wheat?—Yes, wheat also.

28. Q. Do you think it is ever desirable to irrigate it?—From my own experience I say that it will be desirable if attempts were made to irrigate it. I know some tracts in Umrer Tahsil where I allowed spare water in my tank to wheat, water which remained after supplying the rice fields. In that case I had a better wheat crop than I could get in ordinary years.

29. Q. Suppose the Government had made a great number of tanks, would you try and encourage wheat cultivation under them if the soil is black cotton soil?—I am not very sure, because there is the fear of rust. Sometimes it happens that there is a great deal of water, generally in the month of February, when the crops are exposed to rust. I am not sure if it will succeed.

30. Q. Do you know the Nerbudda valley, Hoshangabad and Narsinghpur?—No, not from personal experience.

Mr. Higham.—I understand that you recommend that Government should undertake the construction of a storage work that would supply something like 20 villages?—Yes.

31. Q. What would you do in the case of works that would supply too much for one village and enough for 2 or 3 villages? Do you think that they should be done by Government?—I would recommend it in some cases, because it would not be possible for people of different villages to unite and combine together.

32. Q. Do you think that people of two villages would combine?—In many cases they may not combine. The principle of combination is not known to many people. If they combine it is so much the better, but if they do not, I think the Government should come forward and help them in the matter.

33. Q. I see in a number of schemes worked out in the Public Works Department here, they generally regard the limit as 400 acres and anything below 400 acres is not considered. Do you think that is too small an area to undertake?—I think it is too small for Government to undertake.

34. Q. You think it is better if it is 2,000?—I should say a sufficiently large area.

35. Q. Suppose a tank is made for a large area and is so designed that water can be guaranteed to the whole of the area marked out even in the driest years, what rate do you think people might be asked to pay for water?—I should recommend that if such storage tanks were made and if water is given to high level lands, to lands on higher levels where water

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from ordinary tanks cannot be provided, I believe Rs. 1-8-0 or Rs. 2 the people would willingly pay. But in the case of lands on a lower level, which can be watered by existing tanks, of course they would hesitate to pay at that rate as permanent charge.

36. Q. I am now speaking of rice cultivation?—Yes, I also speak of villages under rice cultivation.

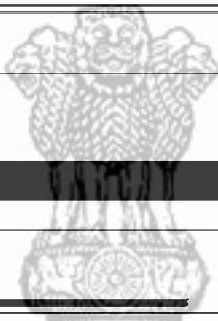
37. Q. Would they be sure of getting water when-

59. Q. What is the usual period?—About 10 or 15 years.

60. Q. You would like the whole period to be given generally?—I would.

61. Q. Do you think that it would be a much prized inducement?—Yes; I should think so.

62. Q. Is there any other way that you could suggest? I cannot suggest any other than what I have



81. Q. You think that distinction should be abolished?—Yes. In the case of poor cultivators if they make an embankment it is as much for his good as for the good of the whole community.

82. Q. Are there plenty of sites on which new tanks could be made?—There are some sites. I cannot answer that question.

83. Q. On account of small tanks in villages you don't think that all the best sites have been taken up?—If *takavi* were liberally advanced and encouragement were given in that way, many people would have small tanks to irrigate their fields.

84. Q. You don't think that all sites have been taken up?—There are some still remaining.

85. Q. Plenty?—I can't definitely say. There are some.

Mr. Rajaratna Mudaliar.—You just said that in case of improvements which are not durable, the same concession should be granted as regards exemption as in the case of durable improvements?—Yes.

86. Q. You referred to field embankments?—Yes.

87. Q. How are they assessed?—If field embankments are constructed, they are classed as embanked lands.

88. Q. And assessed as dry?

Mr. Craddock.—They are classed as embanked Bandia if it is a small embankment, or Bandan if it is a big embankment.

Mr. Rajaratna Mudaliar.—Is there any limit as to the height of an embankment.

Mr. Craddock.—If you put up a big embankment the increased rate should never exceed 25 per cent.

Mr. Rajaratna Mudaliar.—As regards *takavi* loans are they generally granted promptly or is there any delay?—It depends upon the officers.

89. Q. As a general rule?—In the late famine of which I have a large experience they were given very promptly.

90. Q. Because there was a special establishment?—Yes.

91. Q. But in ordinary times?—It takes some little time.

92. Q. What time does it generally take—a month or two—or what?—The Tahsildar has to make some enquiries. It all depends on the convenience of the Tahsildar who has to make enquiries. One Tahsildar may finish the enquiry in a month or he may have other work and may delay this.

93. Q. Do you think that if a special establishment were sanctioned for each taluk or group of taluks, it would facilitate the disbursing of loans—would it encourage people to take loans to a larger extent than now?—Yes, I think it is advisable to do so.

94. Q. What is the rule if the land is heavily mortgaged? Are loans granted or refused in such a case?—Whether the land is mortgaged or not *takavi* is the first charge upon the land. The rights of the creditor are second to those of the Government.

95. Q. You mean that a Government loan takes precedence?—Yes.

96. Q. Do you think that leads the *malguzar* to interfere and object to the grant of loans?—I do not think so. In spite of it many loans have been taken.

97. Q. Do *malguzars* hold themselves responsible for the return of the loan?—Yes, sometimes, when they give consent.

98. Q. Are they required to sign any agreement holding themselves responsible?—No agreement is to be signed.

99. Q. Is the *malguzar* consulted in every case in which a tenant is given a loan?—Not necessarily consulted.

Mr. Muir-Mackenzie.—His consent is not required?—In some cases, in the case of occupancy ryots, his consent used to be taken before the new Tenancy Act came into force.

Mr. Rajaratna Mudaliar.—In the case of occupancy tenants, his consent would be immaterial?—The Government is at liberty to attach his land. Before the Act of 1899, no *malguzar* took objection to a tenant making improvements.

100. Q. What suggestion would you make for encouraging a *malguzar* to construct more tanks?—I

have stated them already. By giving more liberal *takavi*.

101. Q. Are there any concessions?—Of course if a *malguzar* is to make a tank for his people and if he were to promise that he would not charge anything for water, some concession by way of remitting a part of his revenue might be made.

102. Q. Why should he give water without payment, he himself having spent money on the tank? Why should he not charge a reasonable water-rate? The concession that I referred to is whether he may be given exemption from the enhancement of assessment for a term of years?—I would recommend that when he takes the initiative in constructing the tank and does not charge for water some remission in his revenue might be given.

103. Q. Remission or exemption from enhancement?—Remission as well as exemption from enhancement.

104. Q. You would allow him to levy a water rate, and at the same time get his revenue remitted. Would that be fair?—That would not be fair. He should be allowed these concessions in consideration of his not realizing the water rate.

105. Q. If exemption from enhancement alone be granted what period would you recommend?—For all time. Permanent exemption.

106. Q. On what grounds would you justify it?—I have stated the grounds already. He spends money, and considering vicissitude of seasons, and many liabilities such as repairs, etc., to which the improver makes himself subject, the sacrifice made by Government by such exemption will not be too much. It must also be noted that he thereby secures a larger share of Government revenue than his own share. This would also secure fully to people all benefits arising from the improvements on which they spend their money instead of keeping them under suspense that a large portion of the benefit arising out of such an improvement will be appropriated by Government after the settlement.

Mr. Craddock.—Do I understand you to say that you would not make any distinction between durable and other improvements and you would exempt *kachcha* wells for ever?—If it is used for irrigation purposes I would.

107. Q. Very small embankments of which the cost could be repaid in a couple of years?—Embankments costing about Rs. 10 or so.

108. Q. The present limit is Rs. 50. Don't you consider that reasonable?—You may go lower down and make it Rs. 30 or Rs. 20. I don't think that Government would lose much and that would save them from making elaborate calculations.

109. Q. You would give exemption for ever from assessment on improvements?—Yes. That would encourage improvements.

110. Q. In the case of large tanks that irrigate 10 or 20 villages you would like the Government to undertake storage reservoirs, but in the case of a smaller tank you think that *malguzars* might carry it out themselves?—I think so. They may be assisted with *takavi* loans for the purpose.

111. Q. You also state that there is a difficulty in getting people to combine. Do you think it is desirable to make a provision under the Land Acquisition Act by which land may be acquired for tanks?—Yes.

112. Q. I saw a case myself the other day. When they wanted to make a tank other men who owned the land would not give it on account of bad terms?—I have also a case on hand. I have a tank that I wanted to deepen. If it is deepened the water would spread over to another man's field, but he was not willing to give it. It is therefore impossible to deepen the tank.

113. Q. Do you think that there would be any hardship in allowing land to be acquired?—In some cases there will be harshness. But if it benefits a large number of ryots the Deputy Commissioner may do it after consideration.

114. Q. Under proper safeguards you will then recommend it?—Yes.

115. Q. The reason why I asked you this is: one of the chief obstacles in the construction of tanks is the difficulty of getting the small area which a man commands?—Under certain safeguards I would recommend it.

Mr.
Gangadha
Rao.
5 Mar. 01

WITNESS No. 4.—MR. VENKAT RAO, Malguzar of Jam.

Mr.
Venkat Rao
5 Mar. 02.

In reply to Mr. Craddock witness said:—I am Malguzar over six villages in which there is principally rice cultivation; there are some old tanks in these villages and one new tank was made in 1896-97 from special famine loan. One tank was repaired by Government in the famine and one tank made. Government gave three-fourths of the cost and I gave one-fourth; they irrigate rice, there was no sugar-cane. In 1898 the tanks made in 1896-97 irrigated outside my villages; this was done as a trial; no charge was made; the experiment was not a success as the intervening cultivators with tanks of their own let water out to sow rabi. I cannot acquire land for water-courses. One man whose land adjoins mine took surplus water in 1896-97 for sowing seed; he agreed to pay Rs. 20 for two acres. From these tanks in my villages about 700 acres are irrigated; if I gave an outsider water every year he would pay Re. 1 or Rs. 2 per acre. I would pay that myself for dry land irrigated from a Government tank. It would be a good thing for Government to make large tanks which would irrigate 10 or 12 villages; cultivators would be willing to pay every year and not in dry year only; water is nearly always wanted for transplantation of rice or at some particular moment during the rains. If the tanks were made merely to supplement the existing tanks the water would only be wanted in dry years; in other years we generally have enough water, but there are many villages with no water at all. The outturn of irrigated rice is 10 to 15 per cent. in excess of unirrigated in years of normal rainfall and 25 to 50 per cent. taking an average of all years. This year there was an eight-anna crop where there was no water, where they had water the crops was a sixteen-anna one. The tanks in a good year always have surplus water, large tanks have water now; small tanks dry up in September. There is water in two of my tanks now. I would irrigate rabi but cannot acquire land for water-courses; it is not usual to irrigate rabi, I sowed wheat with irrigation one year on a small area as an experiment

and the crop was a poor one; I probably used too much water, 50 acres of my *sir* land were submerged by the tanks made in 1896-97; they were made after settlement and I received no remission.

To Mr. Muir-Mackenzie.—My revenue has not been enhanced on account of tanks as they were made since settlement, but as regards tanks made before settlement people don't understand that there has been no enhancement on their account. The assessment is on the whole of the holdings and not on separate fields; they cannot therefore say if improved fields have been enhanced or not. It would be a great inducement to make tanks if we were granted an abatement of revenue. We have some old *sanads* for tanks but we don't know what they mean.

There are some wells in the village of Jhan on which we grow cane, ginger and other garden crops, the soil is sandy and not fit for wheat; in the famine we irrigated rice but the results were poor. The water is 30 feet below the surface.

There is great delay in getting *takavi* money; sometimes as much as six months. My consent is necessary before a *takavi* loan is given to a *marusi* tenant. I wish particularly to say that it would be a great benefit if *takavi* were given more quickly and on better terms. No instrument should be recovered for five years and 30 years should be allowed for complete recovery. Forms of application should be kept in each village; on receipt of an application the Deputy Commissioner should get the Engineer to inspect the site and approve or not on his report. In addition to the Rs. 4,000 *takavi* granted to me in famine without interest I required Rs. 2,000 to complete a tank. I got this with interest and will have great difficulty in repaying in 15 years. Interest should be reduced to 3 per cent.; the sowcar takes at his pleasure any interest he likes; generally an anna in the rupee a month. The sowcar would not advance for tanks as the return was so uncertain. Government should legislate for right-of-way for water for distribution.

FIFTY-SECOND DAY.

Nagpur, 5th March 1902.

WITNESS No. 5.—MR. F. G. SLY, I.C.S., Commissioner of Settlements and Agriculture, Central Provinces.
Notes on Irrigation.

Mr.
F. G. Sly.
5 Mar. 02.

The information contained in this note is compiled from the official records of the Departments of Settlements, Land Records and Agriculture. My personal acquaintance with the districts of the Central Provinces is confined to 2½ years' service as Assistant Commissioner in the Sambalpur District, 1½ years' service in the same capacity and as Deputy Commissioner of Raipur, and 4 years' service as Settlement Officer of the Hoshangabad District.

2. I attach a statement showing the average rainfall in each month during the past 32 years. This has been arranged into periods coinciding with the general agricultural operations of the provinces. I also give the statistics of the two famine years, 1896-97 and 1899-1900, because in the consideration of irrigation matters it seems as important to know the minimum as the average rainfall.

3. In a second statement I give statistics for the past ten years, showing for each district—

- (a) the area of the principal irrigated crops;
- (b) details of the sources of irrigation.

4. The agricultural conditions of the Central Provinces are very diversified, so that, in considering the question of irrigation, it is necessary to divide it into tracts having fairly homogeneous characteristics. For this purpose I accept the division made in Chief Secretary's letter No. 4938, dated the 3rd October 1901, which is as follows:—

- (1) Chhattisgarh, with its rice cultivation and irrigation from tanks.
- (2) The Wainganga valley, i.e., Chanda, Bhandara, Balaghat and part of Seoni, where rice cultivation and irrigation from tanks is practised.

- (3) The black cotton soil area, i.e., Nagpur, Wardha and part of Chhindwara, where irrigation is almost unknown.
- (4) The Nerbudda valley, i.e., Nimar, Hoshangabad, Narsinghpur and part of Jubbulpore.
- (5) The Satpura plateau, i.e., Betul, the upper portion of Chhindwara and Seoni, in parts of which irrigation is already important.
- (6) The rice tracts of Jubbulpore and Mandla.
- (7) The districts of Saugor and Damoh.

5. With the exception of some of the wilder hill tracts, included for the most part in zamindaris, I do not think that in any part of the provinces there is any obstacle to the extension of irrigation arising from sparsity of population. A common opinion that the Central Provinces are very sparsely populated is hardly correct. It is true that owing to the enormous tracts covered by hills and unculturable lands, the population per square mile is small, but in most districts the population per cultivated acre is fairly high and as dense as can be supported under the present conditions of agriculture. The rice-growing tracts undoubtedly offer the best field for irrigation, and these are the tracts most densely populated. In these tracts the only difficulty that I have ever heard of is an occasional shortness, more particularly since the last famine, of the casual labour required for transplanting rice. This operation must be completed within a short period, and requires many hands, so that a short labour supply is felt. But conditions soon adjust themselves, and if irrigation is available there need be no fear that there will not be people to make use of it.

6. There is an ample supply of cattle for the agricultural needs of the provinces. Many districts still contain large stretches of forest and grazing lands

where cattle are bred by professional breeders; a large number are also bred in almost every village; the northern districts adjoin the famous breeding grounds of Central India. Indeed, an opinion held by many Revenue Officers is that cattle are kept in numbers largely in excess of agricultural requirements, so that the village grazing grounds are over-stocked, resulting in a large half-starved herd instead of a smaller well-fed herd.

7. With a full population and ample cattle there should be no insufficiency of manure. And this is mostly the case in tracts where manure is valued, which are generally the irrigated rice tracts. The supply can largely be increased by more careful preparation and preservation, and the possibility of its profitable utilization will bring about this result. For instance, in wheat-growing tracts, manure is not generally used, and so is not preserved; in irrigated rice tracts, manure and refuse is more carefully preserved. Insufficiently of manure need not in these provinces deter irrigation.

8. In considering this most important and difficult question, there is one principle upon which I place the greatest importance. This is that no irrigation scheme should be taken up in a tract where its utility cannot be justified by existing agricultural practice in that tract or in a tract with similar conditions. An examination of the irrigation statistics appended to this Note will show that almost the whole of the area irrigated is rice, which is practically confined to Chhattisgarh and the Wainganga valley; that the irrigation of field crops grown in the black soil areas of Saugor, Damoh, the Nerbudda valley, the Plateau districts and the Nagpur country is infinitesimal; and, finally, that garden crops are irrigated to a small extent in most districts. There must be strong reasons for this glaring diversity of agricultural practice in regard to irrigation, and the conclusion to be drawn seems to me clear—that irrigation is not profitable for black soil areas growing wheat, cotton and juar. I will deal with this question in more detail when I discuss each tract, so that it is sufficient here to emphasize the fact that there are large areas, almost wholly black soil, in which existing agricultural practice gives no encouragement to irrigation schemes. And Government should, in the first instance, confine its efforts to tracts where agricultural practice shows that irrigation will most certainly be profitably used if it is provided.

9. The agriculture of the provinces is practically wholly dependent upon the rainfall of the year. The irrigated area is itself small save in the rice districts, and in those districts the sources of irrigation are dependent upon the monsoon rainfall. There are but few tanks in the provinces which hold a sufficient supply of water to give irrigation in a year of rain failure. To cite an instance, only 50 tanks were used to irrigate 25,000 acres in 1899-1900 in the Chanda District, whereas in a normal year 5,877 tanks irrigate 145,000 acres. The few tanks which succeeded in 1899-1900 are mostly those fed from perennial springs issuing from the foot of hills. If complete protection is essential, the irrigation source must have a reserve supply sufficient to last over a year of drought, or must have feeders practically independent of the season's rainfall. I apprehend that few irrigation schemes will be found to fulfil these conditions, but this should not bar the undertaking of schemes which will save the crops in years of scanty rainfall, or in years when the rainfall is so badly distributed as to cause failure. A scheme which seems to have much promise is that canals or channels should be made to intercept the rainfall of a large catchment area or the water of rivers, and to lead it along ridges with branches to fill the tanks of the adjoining country.

10. The lack of capital is certainly one of the obstacles to the extension of irrigation. The owner of a village in which there is a good site for a tank has not the necessary means to make the tank; the tenant has not the means to construct an expensive *pucca* well. Some suggestions for lessening this obstacle will be made later on.

11. The fear of an enhanced rent or revenue assessment has, sometimes, been stated to me to be the reason why facilities for irrigation are not made use of, and there seems some truth in this explanation. Under the existing rules (Revenue Book Circular I-13) all durable improvements to land are exempted from an enhancement of rent or revenue

on that account at the next succeeding settlement, provided that the improvement is a substantial one, credit being ordinarily not given for a larger area than one acre for every Rs. 15 of outlay, though in special cases the minimum outlay per acre may be reduced to Rs. 12. In the case of specially costly works the period of exemption may be extended by the sanction of the Chief Commissioner on the representation either of the Deputy Commissioner of the District or the Settlement Officer engaged in its assessment. This exemption from an enhancement of revenue to the landowner is secured automatically for the remaining period of the current settlement, and by assessing at dry instead of wet rates at the next recurring settlement (Article 212, Settlement Code). Exemption from enhancement of rent on the ground of his improvements is secured to the tenant during the period of settlement by the provisions of the Tenancy Act, and by assessing at dry instead of wet rates at the next recurring settlement.

12. Most of the tanks and other sources of irrigation date from the period of native rule, and there seems no doubt that the number constructed under British rule has decreased, although there are still many sites available. It will then be of interest to examine the methods by which native rulers stimulated the construction of irrigation works. Under Mahratta rule, the farmers of villages had no security of tenure, but they were not disturbed when they made substantial improvements. This inducement was removed by the British Government by the general conferral of proprietary right. The Mahratta ruler said: "Make a substantial tank, and I will give you security of tenure." The British Government said: "I give you security of tenure in the hope that you will now make a substantial tank in your own property." The gift has not been so successful as the promise. Under the Gond kings, great encouragement to tank construction was given by the grant of the land irrigated on a quit-rent known as a "tukam." The quit-rent was nominally fixed in perpetuity, but was in practice sometimes raised. The quit-rent was generally lower than the rent which would have been paid at dry rates, but the Government gained by obtaining the nucleus of stable cultivation for the establishment of a village in which cultivation spread to other dry land. This system was continued by the Mahrattas, and under it most of the large tanks of the Chanda District were constructed. It is for considerations whether a scheme could not be framed somewhat on the lines of this system.

13. The present rules give sufficient inducement for the construction of small works, but the terms might be made more liberal for large works. They are not understood by the people who are unable to distinguish between an enhancement of rent or revenue made on account of general considerations, such as the rise of prices, &c., and an enhancement made on account of improvements. For this reason I would suggest that no enhancement whatever should be made upon land substantially improved for a period of years fixed upon a sliding scale. Government may well forego for a fixed period of years any enhancement due upon general considerations where land is substantially improved. The period of settlement is an uncertain period, and has of late years tended to be short in these provinces. It is not sufficient, as under the present rules, to allow the Deputy Commissioner or Settlement Officer to make a separate representation in the case of specially costly works; there should be a fixed scale which all may know. I would, as at present, fix a minimum limit that the exemption shall not be given for a larger area than one acre for every, say, Rs. 15 of outlay. And I would then fix the period of exemption from all enhancement on a sliding scale of so many years for so many hundreds of rupees. An instance of such a scheme successfully worked is that known as the rules for the establishment of rice villages through a *patel* (Article 391, *et seq.*, of the Settlement Code). Under these rules a grant of waste land suitable for the formation of a rice village is made to a person willing to colonize it, on condition that he will construct a tank for irrigation. The revenue of the village is remitted for a period of years depending upon the amount of money expended on the tank, the following scale being in force:—

For Rs. 500 or less	...	one year's remission for every Rs. 100.
Exceeding Rs. 500—		
For the first Rs. 500 ...	"	"
Rs. 501 to Rs. 1,500 ...	"	"
Rs. 1,501 and over ...	"	"
		100.
		200.
		300.

Mr.
F. G. Sly
5 March 05

Mr.
F. G. Sly:
March 02.

Thus, for constructing a tank at a cost of Rs. 3,500, a remission of 17 years is given. At the end of the remission period, the village is regularly settled ryotwari, and the grantee is made watandari Patel on a favourable rate of commission. This scheme has worked very successfully in the district where there are waste lands suitable for rice cultivation. The inducements offered include not only the remission but the opportunity of acquiring additional land in ryotwari right and the patelship of the village. I would suggest some similar scheme of exemption in malguzari villages. If the proprietor constructs a tank, the area irrigated by it should be marked off into a "tukam," the existing revenue determined, and an exemption from all enhancement of revenue granted for a period of years varying with the amount of the outlay. It might also be for consideration whether a further partial exemption should not be given for a second period of years, and finally, whether a small exemption should not be granted in perpetuity. This would, undoubtedly, appeal to the feelings of the people, who draw a great distinction between an ordinary proprietor and a "maufidar," no matter how small the money value of the maufi grant may be. For example, a perpetual grant at $\frac{1}{3}$ th jama would mean but little money loss to Government, but would be greatly prized by the receiver.

14. I attach a statement showing the amount of Land Improvement Loans, the loans made under the Land Improvement Act during the last ten years. From this statement it will be seen that such loans are not freely taken, the sum advanced having been small, except during the famine of 1896-97. And during the past few years this form of loan has not been encouraged, because all the available funds have been required to meet the more urgent need for loans under the Agriculturists' Loans Act. The reasons which hinder landholders from making private irrigation works also deter them from taking loans, save that in the latter case the want of capital is removed. The cycle of bad years has also made many landholders hesitate before incurring additional liabilities for land improvement. But the main reason which makes these loans unpopular is the strictness of collection. A landholder will prefer to take a loan on a higher rate of interest from a money-lender, who will not press him for punctual re-payment, rather than to take a land improvement loan from Government which he knows must be repaid upon the dates fixed. It is not possible for Government to encourage carelessness in repayment, although a more liberal policy of suspension for good cause may have some effect. The present rules regarding the rates of interest are as follows:—

"Interest shall be charged on loans made under these rules at the rate of 6½ per cent. per annum. Provided that if an instalment of principal or interest be not repaid on the date fixed, it shall be in the discretion of the Deputy Commissioner of the district to charge interest upon it at the rate of 12½ per cent. per annum. Provided also that the Chief Commissioner may, in special cases, sanction the grant of loans at a lower rate of interest or at no interest."

"Interest on each loan shall ordinarily run from the date on which the loan was made. But with the sanction of the Commissioner, the running of interest may be delayed until a date which shall precede by at least six months the dates fixed for the re-payment of the first instalment of principal."

These rules are sufficiently liberal, and I do not think that any reduction of the rate of interest, which at present is below the local rates, would encourage the grant of these loans to land-holders really requiring them for land improvement. Indeed, a reduction of interest would encourage a form of abuse, which at present is not unknown, or well-to-do capitalists taking a loan on the ostensible ground of land improvement, but really to obtain the use of cheap money. For similar reasons I would not recommend a remission of the interest. A partial remission of the advance might encourage these loans, but it seems open to strong objections as a regular practice. But I would grant a partial remission in case of failure of the attempt to obtain water. If the whole is remitted, there is the possibility that carelessness in construction may be encouraged, so that even in cases of total failure it might be advisable to collect a small sum in order to enforce responsibility. The rules regarding the period of re-payment are as follows:—

"The date of the first instalment shall not exceed three years from the date of the order granting the loan, and shall be fixed with reference to the time when the improvement will begin to yield a return. The date of the last instalment shall not in any case exceed 35 years from the date of the order granting the loan, and shall not exceed 15 years without the Commissioner's sanction."

"The amounts of the instalments may be so fixed as to increase with the productiveness of the improvement, or an arrangement may be made for the re-payment of interest and principal in consolidated sums after the fashion of an annuity."

These rules are sufficiently liberal as regards the period of re-payment. A grant-in-aid would not, in my opinion, do much to encourage these loans. This

was tried in the first famine but largely failed, although this failure may perhaps be due to the fact that the loan was required to be spent on works managed on famine relief principles and not as an ordinary work. I have heard but very few complaints in these provinces, that the whole amount of the loan does not reach the borrower without deduction, but in order to lessen the risk of this speculation, I would recommend that it should be an instruction, that so far as possible preliminary enquiries and the actual payment of the sum should be made by an officer not below the rank of Assistant Commissioner, and preferably on the spot whilst he is on tour. The rules themselves are sufficiently liberal, but they might in practice be more liberally interpreted.

15. The Tenancy Act of the Central Provinces leaves no uncertainty of tenure which can deter a

land-holder from constructing irrigation works. Indeed, the old feeling still survives from the times of native rule, that a land-holder who makes permanent improvements is entitled to greater stability of tenure than one who does not. The legislation of 1898 removed the defect under which an ordinary tenant laboured is not being entitled to make improvements. The law also enforces the liability of a landlord to pay compensation for improvements to a tenant on ejection.

16. There are some other obstacles to the construction of tanks, which are the most important form of irrigation works in these

provinces. Suitable sites for tanks may already be occupied by persons who are unwilling to give up or exchange their rights; a site suitable for the construction of a tank which will irrigate land in one village may be situated in another village or even in the Government forests; in some parts the holdings are so scattered that it is not worth the while of any individual holder to construct a tank which will command only a small portion of his own land. These and similar causes sometimes prevent the construction of tanks upon suitable sites.

17. I do not think that the extension of irrigation tends to injure the remaining cultivation by extension of irrigation by attracting its cultivators to the ir-

rigated tracts. On the contrary, there is sufficient population to cultivate any newly-irrigated land without disturbing old cultivation. In times of famine, there is a tendency in rice districts for the cultivators to desert unirrigated rabi land and to congregate upon irrigated rice lands, but this is a temporary phase which soon rights itself; it is only an instance of the general principle that in years of scarcity the least profitable land is the first to go out of cultivation. Throughout the rice districts there is a very strong desire evinced by the people to have the means of irrigation extended. The cycle of uncertain seasons during the past decade has prominently brought home to them the necessity of irrigation for the security of rice cultivation.

18. There are no canals in these provinces, so that I am unable to give any information concerning canal irrigation.

19. Having thus endeavoured to deal with some of the general questions asked by the Irrigation Commission, it will be more convenient for me to consider the remaining questions in relation to the separate tracts referred to in paragraph 4 above, and I first take up.

CHHATTISGARH.

Although there are a few tracts in which rabi staples are grown, this tract is almost wholly a rice country, and any irrigation projects must mainly be directed to the irrigation of rice. In the following table I give some details of the average area irrigated for the six years 1890-91 to 1895-96. This period is taken by me because it shows the normal conditions prevailing prior to the famine years:—

Districts.	Net cropped area.	Area under rice.	Total irrigated area.	Area of irrigated rice.	Percentage of cropped area irrigated.	Percentage of rice area irrigated.
1	2	3	4	5	6	7
	Acres.	Acres.	Acres.	Acres.	Percent- age.	Percent- age.
Raipur	2,224,553	1,305,903	25,768	19,889	1	1
Bilaspur	1,298,648	832,562	81,074	28,453	2	3
Sambalpur.	596,703	399,696	28,583	23,359	5	6

20. Almost the whole of the irrigation is from tanks,

Methods of irrigation.

which is not supplemented by irrigation from wells given to the same land. These tanks are filled by the surface drainage from the catchment area, which is very seldom increased by diverting water from a nallah. The water is distributed by a direct cut in the embankment, which is annually made good again, the water being led along open earth channels to the fields at a lower level. There is not much loss from percolation through these channels, for they generally run through fields which are being irrigated. In years of ample rainfall, the supply of water is sufficient for the area commanded, but in years of scanty rainfall the smaller tanks fail, the supply being used up for waterings in August–September, leaving no balance for the watering required by heavy rice in October. In years of drought, all the tanks fail except the very few large ones. Experience shows that in a year of drought only the very largest projects succeed. The too late commencement of the supply may cause some damage, but not so much as the too early cessation, because the late monsoon rainfall is more precarious than the early falls. It is very essential for heavy rice to get water in October. Apart from the cost of constructing the tank, there is very little expenditure required to bring the water to the fields. The annual maintenance of the bunds in the rice plots and the clearing of the water channels is a small matter. The available supply of manure is generally used for the irrigated plots. These expenses are incurred by the owners of the fields. As a general rule, the owner of the tank is responsible for its maintenance and repairs, but there is a general tendency for the malguzar to shirk this responsibility and endeavour to throw it on the tenants. The cost of ordinary maintenance does not exceed Rs. 10 a year for each tank, but if there is a break in the embankment, a good deal more has to be spent. Tanks are often kept in a bad state of repair, particularly where the owner has himself little or no land below the tank, because the owner will not do the repairs himself and will not let the tenants do it, under an impression that they may thereby acquire some definite rights in the tank. There is no need for legislation to remedy this defect, for action can be and is being taken under the conditions of the record-of-rights of each village. The distribution of water is arranged by the owner of the tank, supported or opposed by the general consensus of village opinion. In years of scanty rainfall, this matter always gives rise to a large number of disputes, which are often settled by the revenue authorities. In the rare cases, where separate water-rates are charged by the owner of the tank, no difficulty is experienced in collection, for they are generally paid in kind at harvest. Some inconvenience is experienced from the liability of tanks to silt up, particularly where cultivation is carried on in the bed or catchment area of the tank. The depth of silt deposit depends upon the soil in which the catchment area is situated. It is not annually removed, its use as manure being very limited; but is allowed to accumulate until the efficiency of the tank is interfered with when it ought and sometimes is removed.

21. The statistics given above will show that the

Extent of irrigation.

protected area forms a very small proportion, for which there are many reasons. The principal is that the holdings of cultivators are exceedingly scattered, each occupying many minute lots dotted all over the village. It is therefore not possible for any person to construct a tank which will command a sufficient quantity of his own land to justify the outlay, whilst common action by the village community is impracticable. Again, a tenant will often not give up the land best suited for making the tank. Further, the site suited for a tank may be in a village other than the village which would profit by its construction. All these reasons tend to deter private persons from constructing tanks even if they have the means and the desire to improve their cultivation. The area irrigated varies considerably from year to year, depending upon the seasonableness of the rainfall. There has been a considerable increase in the past six years when the rainfall has been uncertain. The maximum and minimum areas irrigated since 1890-91 are as follows:—

Districts.	MAXIMUM.		MINIMUM.	
	Year.	Area.	Year.	Area.
1	2	3	4	5
Raipur . . .	1896-97	62,027	1900-01	12,516
Bilaspur . . .	1896-97	76,363	1900-01	1,043
Sambalpur . . .	1896-97	71,058	1900-01	5,453

In 1896-97 the rainfall of the early monsoon was enough to fill the tanks, and these were used to the utmost with the complete cessation of rain in September. The conditions were very different in 1900-01; the monsoon was fairly suitable and there was little need for cutting the tanks. Again, the people had just come through a severe famine and had not the energy to push irrigation.

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In the examination of these statistics there is an important consideration which must not be neglected. The areas shown as irrigated are those only to which water was actually given. They do not include areas benefited by percolation from the tank, which is the main purpose for which tanks are made in Chhattisgarh. Including this form of irrigation, an average tank will irrigate about 25 acres of land, whilst a good tank will irrigate about 100 acres.

22. Transplanting of rice is very seldom practised in Raipur or Bilaspur, whilst in Sambalpur only about 3 per cent. of the rice is transplanted. This may partly be due to want of knowledge and energy, but the local conditions have much influence. In unirrigated areas and with uncertain irrigation, it is very important that the crop should come to maturity before the rains cease. Transplanted rice ripens much later than rice sown broadcasted, so that it is necessary to use the latter method to secure a crop before the rains stop in October. With good irrigation, there can be little doubt that transplanting would become more popular.

23. Under the present system of assessment, an addition to the rent of the cultivator is made for irrigated land. The area classed as "irrigable" is not the area actually irrigated, but the area irrigable, although in determining this area it is necessary, for caution, to confine the classification to land which has at one time or another been actually irrigated. This extra wet-rate is based upon a consideration of the advantages of irrigation judged by crop experiments, actual rents, and by the opinion of the people. But it is necessarily lower than a full water-rate, because allowance has to be made for the inferior sources of irrigation with an uncertain supply of water. This additional charge upon irrigable lands is, therefore, not a true measure of the value of irrigation, but it is a most important help in these provinces in determining the value of irrigation. Under the present system of fixing rents, this additional value of irrigable land is expressed by an addition to the number of soil-units used to represent the rental value of dry land. The difference between the soil-units fixed for irrigable land and for dry land multiplied by the prevailing unit-rate will give the additional rental at present imposed by Government upon irrigable lands. In the Raipur District the soil factors were increased for irrigability 50 per cent. in kanhar and dorsa soils, 66 per cent. in matasi soil, and 100 per cent. in bhata soil. Taking the average standard rate of the district, the extra rental value of irrigable land may be stated at 7 annas 2 pies per acre. In the Bilaspur District the percentage of increase varied from 39 per cent. in kanhar soil to 140 per cent. in bhata soil. The average additional rental value for irrigability in this district was about 6 annas 5 pies per acre.

24. In these provinces the proprietor of the land is usually the owner of the irrigation work, and the charge made for the use of water is included in the rent of the land. It is, therefore, very difficult to estimate what portion of the rent is for the use of the land and what portion for the use of the water. Again, rents are almost invariably fixed in a lump-sum upon the whole of the cultivator's holding, so that it cannot often be said what portion of it is paid for irrigated lands and what portion for unirrigated lands. I have endeavoured to compare some instances of the rent paid for irrigated lands with the rent paid for unirrigated lands; but the areas are so small that no reliable deductions can be made. In Chhattisgarh I have been unable to ascertain any rents paid separately for irrigated areas, except in case of small vegetable gardens, where the rents are often Rs. 3 to Rs. 10 per acre inclusive of the payments for land and water. This may be left out of consideration. It is also necessary to take into consideration the general level of rents, for, with a very low acreage rate like that prevalent in Chhattisgarh, there will be a greater disinclination to pay a water-rate largely in excess of the rent.

25. In a very few cases irrigation works are owned by persons other than the proprietor of the land irrigated, where an actual charge is made for the use of water by the cultivator. This is a most important factor in determining a water-rate which Government might impose; but the instances which I have been

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able to discover are few. In Raipur there are a few cases in which payment is made for water to the owner of a tank. The water-rates run as high as Rs. 10 an acre for sugarcane; but for rice vary between 6 annas and Rs. 2 per acre. The area is small, but points to about Re. 1, being a fair water-rate for rice. In Bilaspur a rate of Rs. 2 is paid in one instance over a fair area.

These rates are paid for the area actually irrigated.

26. The standard outturn of rice in the Raipur and Bilaspur Districts is 900 lbs. of unhusked rice per acre.

The yield of irrigated rice. This is probably too low for present considerations, when the catch-crops of rice raised on uplands may be neglected. For soils ordinarily brought under irrigation, the outturn of unirrigated rice may be put at 1,000 lbs. per acre, and of irrigated rice at 1,500 lbs. per acre. This gives a value of 500 lbs., or, say, Rs. 6-4-0 for the irrigation. In Sambalpur the outturn of unirrigated rice is about 1,100 lbs. per acre, and of irrigated rice 1,700 lbs.; the value of irrigation is there Rs. 7-8-0. These figures may be taken as applicable to a year of normal rainfall. In a year of scanty rainfall, the outturn of irrigated and unirrigated rice may be put at 400 lbs. and 1,400 lbs., respectively, whilst in a year of drought the yield of unirrigated rice will practically be nil, and of irrigated rice from 700 lbs. to 1,200 lbs., varying with the quality of the irrigation. These estimates are based upon an examination of the crop experiments.

27. There can be no doubt of the great agricultural value of irrigation in the Chhattisgarh country. I have already stated how largely it increases the outturn of rice. This increase is not limited to years of deficient rainfall; but in every year irrigation is of value, for there is always some period during which irrigation is an advantage. One of the most important advantages of irrigation is that it permits of growing transplanted instead of broadcasted rice, resulting in a largely increased outturn with less seed again. Again, in unirrigated land, it is only possible to raise coarse varieties of rice which early come to maturity, whereas with irrigation the fine varieties of great value can be grown. Another most important advantage is that in irrigated land a second crop can often be raised. The system is somewhat peculiar; pulses or linseed are sown in the wet field, whilst the rice crop is still standing; the seed germinates in the wet bed, and after the cutting of the rice grows without any further irrigation. The yield of the second crop is not so large as if sown in fallow land; but it amounts to at least an average of 100 lbs. to the acre. To show how entirely double-cropping depends upon the rainfall and irrigation, it may be noted that the area under double-crops in Chhattisgarh fell to 66,327 acres in 1899-1900, whereas the normal area is 966,840 acres. Irrigation also gives to Government the greater security of the revenue and to the agriculturists the largely increased profits of greater stability of cultivation. The lands abandoned in the recent famines are the high-lying unirrigated fields, whilst the low-lying irrigated fields have continued to be cropped.

28. For the above reasons I would strongly urge Recommendation for extension of irrigation in Chhattisgarh. The soils are generally suited to irrigation except, the very heavy black soil which lies in the valleys along the river banks. The tank system of irrigation is that most suited to the local conditions, and there is ample scope for its extension. The construction of tanks by private persons should be encouraged by more liberal terms in the matter of exemption from enhanced assessment, as recommended in paragraph 13 above, and by more liberal action under the Land Improvement Loans Act. There is also ample scope for the construction of irrigation reservoirs by Government, more particularly large works which are beyond the means of private persons. These should be extensive irrigation works which will prove effective in years of drought.

29. Any irrigation works that may be constructed by Government will, for the most part, take the form of reservoirs, from which water will be given by flow to the country below them. It seems with works of the description indicated, there are practical difficulties to overcome before Government can charge for the actual amount of water used or at a fixed rate for each watering; the cost of maintaining an establishment for measuring the water taken by each cultivator, the number of waterings, or the area actually irrigated would, except in the case of large works, be practically prohibitive. I therefore suggest that a water-rate should be charged each year at a fixed rate over a fixed irrigable area, irrespective of the amount of water used. The rate must, therefore, be fixed lower than would be the case if it were only to be realizable upon the actual use of water.

30. A further question arises how Government can impose a fixed water-rate of this nature. I know of no legal power which the Central Provinces Administration possesses for imposing a water-rate without first obtaining the consent of the cultivator. At a revision of settlement Government has the power to fix rents, and might include in the rent the amount of water-rate which it thought fit to impose. But there seem to be objections to even this course, whilst the proprietor of the land would be entitled to his share of the rent. Section 13 of the Tenancy Act provides for the enhancement of rents on account of improvements made by the landlord; but there is no corresponding provision regarding improvements made by Government. Until the law is amended, the water-rate must then be so fixed that the cultivators and proprietors of the land concerned will agree with Government to contract for its payment. Section 157-A of the Land Revenue Act runs as follows:—

"Rents, fees and royalties due to the Government for the use or occupation of land or water (whether the property of the Government or not) or on account of any products thereof, and all monies falling due to the Government under any grant, lease or contract which provides that they shall be so recoverable, may be recovered under this Act in the same manner as an arrear of land revenue."

I apprehend that under this section the rent due for the use of water must be legally due under some Act or under some grant, lease or contract to which the users of the water are a consenting party. Government must then obtain the consent of the users to the water-rates, and the rates must be sufficiently low to induce the users to give that consent. It will probably be necessary to amend the law by providing for the levy of water-rate on Government irrigation works.

Taking all the available information into consideration, it would seem that in Chhattisgarh a water-rate of Re. 1 per acre may safely be estimated at the commencement, which may be raised to Rs. 1-8-0 and then to Rs. 2, after the cultivators become accustomed to the payment and to the advantages of the water. It will be necessary to make an allowance to the proprietor for collecting the water-rate, which may be stated at 2 annas in the rupee.

31. I now turn to the Wainganga valley, which contains the finest rice cultivation in the provinces. There are some stretches of black soil devoted to rabi crops, which are seldom irrigated; but the main crop is rice, usually grown on yellow soil, or on an admixture of yellow and black soil. A fair proportion of the rice is already irrigated, and almost wholly from tanks. These tanks are much better than those usually found in Chhattisgarh, often having masonry sluices to regulate the supply of water. There are also some tanks which obtain their water-supply from perennial springs issuing from the foot of hills. Some of these seem to show great promise of being able to be largely increased, whilst some other similar sites might be found in Government forests. In regard to the system of management, &c., the remarks made about Chhattisgarh apply generally to the Wainganga valley.

32. Figures for the portion of the Seoni District included in the Wainganga valley are not available; but the following statistics of the remaining three districts (excluding zamindaris) are of interest:—

Statistics of Irrigation.

Districts.	Net cropped area.	Area under rice.	Total irrigated area.	Area of irrigated rice.	Percentage of cropped area irrigated.	Percentage of rice area irrigated.
1	2	3	4	5	6	7
	Acres.	Acres.	Acres.	Acres.	P.c.	P.c.
Balaghat . .	3,47,814	231,887	78,699	75,645	25	32
Bhandara . .	591,814	342,207	154,452	144,640	26	42
Chanda . .	622,953	186,365	146,676	139,906	24	75

In these districts the advantages of irrigation are fully appreciated, and there is no doubt that water, if supplied, would be freely taken. It is of more advantage to rice grown on yellow soil than on black soil, but irrigation on black soil gives the opportunity of raising a second crop. The rice is ordinarily transplanted, about 80 per cent. of the rice being so grown. The yield from transplanted rice largely exceeds that of broadcasted rice; the Settlement Officers of Balaghat and Seoni indeed estimate that it is

about 50 per cent. larger. There is practically no year in which irrigation is not desirable for transplanted rice. The maximum and minimum irrigated areas are :—

Districts.	MAXIMUM.		MINIMUM.	
	Year.	Area.	Year.	Area.
1	2	3	4	5
		Acres.		Acres.
Balaghat	1893-94	85,020	1899-1900	12,803
Bhandara	1893-94	164,552	1899-1900	30,598
Chanda	1892-93	148,312	1899-1900	24,940

The irrigated area usually keeps fairly constant, the great drop in 1899-1900 being due to the failure of the water-supply in the tanks.

33. The excess wet-rate imposed at settlement was Re. 1-1-6 per acre in Balaghat, 15 annas in Bhandara and 13½ annas in Seoni. The Chanda settlement has not yet been made, but the excess rate should approximate to that in Bhandara.

34. There are a certain number of cases in these districts where a water-rate is paid to owners of tanks; but these rates are often paid in kind, sometimes only when water is actually taken and sometimes every year irrespective of the amount of water taken. From enquiries I find that in Bhandara the annual water-rate for rice may be as low as Re. 1, but is usually at least Rs. 2. Water-rates for rice run up as high as Rs. 6 to Rs. 10 per acre; but these are generally the survival of water-rates fixed for sugarcane, the cultivation of which has been given up.

In Chanda a common water-rate for rice is 1 khandi of grain for 1 khandi of land, which works out to Rs. 2 per acre. Cash rates vary from Re. 1 to Rs. 3 per irrigated acre. The differences in rent-rates are very striking in the rice tract, unirrigated non-rice land paying about 4 annas per acre, whilst irrigated rice land pays about Rs. 2 per acre. For sugarcane land, a general water-rate is Rs. 4-8-0 per irrigated acre, whilst it runs up as high as Rs. 6 and Rs. 10.

35. The standard outturns of rice are much higher than in Chhattisgarh, owing to superior irrigation and methods of cultivation. They are :—

	lbs.
Balaghat	1,400
Seoni	1,200
Bhandara	1,600
Chanda	1,500

In Balaghat the Settlement Officer considers that the difference of outturn between irrigated and unirrigated rice is 1,210 and 1,585 lbs., whilst the Settlement Officer of Seoni gives it at 1,060 and 1,850 lbs. It may, I think, be safely put at an average of 1,100 and 1,700 lbs., which gives a profit of Rs. 7-8-0 for irrigation. In years of scanty rainfall the yields of unirrigated and irrigated rice will be about 600 and 1,600 lbs., respectively, whilst in a year of drought, unirrigated rice will yield nothing whilst irrigated rice should give an outturn of 1,100 lbs.

36. Apart from the increased outturn of irrigated rice, irrigation will lead to more transplanting which again increases the yield. A larger quantity of seed is required for transplanted areas and the cost of cultivation is greater, but this is small compared with the increased yield. Heavy varieties of high value will displace light varieties of small value. An extension of double-cropping will follow. The capacity for bearing a double-crop depends upon the character of the soil, for there must generally be an admixture of black soil. Sometimes a second crop of rice is raised, but it is generally lakh, peas or gram. Lakh is generally sown before the rice is cut, whilst peas and gram are sown after the rice is cut. Land at present growing poor miscellaneous crops can, with irrigation, be put down to valuable heavy rice, raising the rent-rate from 4 annas to Rs. 2. For these reasons I would strongly advocate an extension of irrigation in the Wainganga valley. Taking all the circumstances into

consideration, it would seem that a water-rate of Re. 1-8-0 per acre might easily be taken upon rice, and that it might be raised in a few years to Rs. 2.

37. In the black soil areas of Nagpur and Wardha there is very little irrigation. The principal crops grown are cotton, juari and wheat. One side of Nagpur borders on the Wainganga valley, and in this tract there is some rice cultivation which is inferior to that of the Wainganga valley proper. The excess wet-rate imposed at settlement upon rice lands was 15 annas. The outturns of irrigated and unirrigated rice are estimated by the Settlement Officer at 1,600 and 1,280 lbs. in black soils, and 1,280 and 760 lbs. in red soils. The extra profit from irrigation may then be put at Rs. 7 per acre. In this tract, the wet-rate might be fixed slightly lower than in the Wainganga valley proper. The statistics of the two districts are given below :—

Districts.	Net cropped area.	Area under rice.	Total irrigated area.	Area of irrigated rice.	Percentage of cropped area irrigated.	Percentage of rice area irrigated.
1	2	3	4	5	6	7
	Acres.	Acres.	Acres.	Acres.		
Nagpur	1,236,345	38,333	23,407	13,281	3	40
Wardha	927,977	5,683	2,725	7	...	...

In the true black-soil area there is practically no irrigation. The crops of cotton and juar suffer more often from an excess of moisture in the retentive black soil than from any lack of it. Irrigation will, in my opinion, have little agricultural value, and I do not think that Government should extend it in this tract.

38. The Nerbudda valley is another black-soil tract, in when there is practically no irrigation. In is principally a rabi country, the principal crops being wheat and gram. The average agricultural statistics for the years 1890-91 to 1894-95 are as follows :—

Districts.	Cropped area.	Area under wheat and its mixtures.	Total area irrigated.
1	2	3	4
	Acres.	Acres.	Acres.
Jubbulpore	1,071,103	445,384	2,631
Narsinghpur	629,892	231,375	2,328
Hoshangabad	1,030,155	632,913	3,022

The amount of irrigation is infinitesimal, and is confined for the most part to small garden plots. There are practically no tanks, the irrigation being made from wells. This is strong evidence against the advantage of irrigation in this black-soil area, for there are some sites in which tanks could advantageously be constructed, whilst irrigation could also be carried on from some of the streams. In the eastern portion of the valley, many of the fields are embanked with substantial banks, which hold up the water during the rains. In these a first crop of rice is often taken; but irrigation is not required for it. This system of field embankments is a substitute for irrigation, generally ensuring a moist field for the sowing of wheat. In the western portion of the valley, the fields are not embanked, and a single crop is raised in the winter. There is a sharp division between the tract in which black-soil fields are embanked and those in which they are not embanked. This difference of practice is marked by a difference in the consistency of the soil, the embanked areas having a soil of stiff clayey consistency, whilst the un-embanked areas have a more friable soil. It is, therefore, a question for decision whether embankments can profitably be extended to the latter areas. Existing agricultural practice would seem to give a negative reply; but on the other hand it is confidently asserted by others that the difference of soil consistency is the consequence and not the cause of embanking. This is a question which the Agricultural Department should set itself to solve, and if it is found that field embankments can profitably be extended, land improvement loans should be freely given for this purpose.

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Apart from this system of quasi-irrigation, I do not think that effort should be made to extend irrigation in the true black-soil areas. Wells are impracticable, because the water is found at very great depth and only *pucca* wells built at great expense will stand. In ordinary years the black soil retains sufficient moisture to grow rabi crops without any need for irrigation. In years when the cold-weather rain is sufficient, there is a strong opinion amongst the cultivators that irrigation does more harm than good by inducing rust. Too much weight should not be given to the experience of the past few years when the rainfall has been deficient, for in earlier periods more damages has been done by excessive moisture than by excessive drought. And it is impossible now to justify irrigation on any permanent change in the climate of this part. Moreover, a very much larger quantity of water is required for irrigation in black-soil than in red-soil. Irrigation without manure is not very profitable, and the Nerbudda valley cultivator has not as yet learned to use manure. The standard outturns average 600 lbs. for unirrigated and 1,000 lbs. for irrigated wheat; but I presume that the latter outturn is in manured fields. Over a series of years irrigated wheat will undoubtedly give larger yields than unirrigated wheat, but the difference may not be so great as that shown above. It is a very doubtful experiment to undertake irrigation works in a tract where its utility cannot be justified by existing agricultural practice, and I would deprecate any Government measures to this end in the black soil of the Nerbudda valley. But there are some sandy stretches in the valley, principally along the banks of rivers, where irrigation can profitably be practised and where there is already some well irrigation. In these stretches water is found within a reasonable depth of 10 to 20 feet, and where good irrigated crops of wheat and vegetables can be grown. I would encourage the construction of wells in such tracts by liberal land improvement loans.

39. The Nimar District, although situated in the Nerbudda valley, has exceptional conditions which differentiate it from the districts higher up the valley. It has the lightest rainfall in the provinces, and in consequence the character of the cultivation changes, cotton and *juari* being the most important crops. The ordinary kharif cultivation is all dry, but alongside it is carried on a small amount of well-irrigated is applied to some 13,000 acres, or Well-irrigation is applied to some 13,000 acres, or about 2 per cent. of the cultivated area. This is most common in the centre of the Khandwa tahsil, where water is obtained at an average depth of about 25 feet. I have never heard that the water obtained is saline. Wells are generally to be sunk through some rock, the cost varying from about Rs. 50 for a *kachcha* well to Rs. 400 for a *pucca* well. A well will irrigate from 3 to 8 acres. The extra wet-rate assessment imposed upon the area irrigable from a well varies from Re. 1 to Re. 1-13 an acre. Any extension of well irrigation depends upon the character of the soil, for even in adjoining villages water may be found at a workable depth in one and at an unworkable depth in the other. The supply of water is mostly from percolation. The "môt" is the ordinary means used for raising water, and it is difficult to improve upon it at the average depth of the water. I am not in favour of the construction of wells by Government, for the people can themselves construct them at less cost. But I would give Government assistance in the shape of expert advice for the selection of suitable sites, trial boring, and the use of boring tools particularly for hard rock which is beyond the capacity of the cultivator. A small expert establishment should be placed under the Agricultural Department for employment on this duty. Their services should be placed at the disposal of cultivators, no fee being charged when their efforts are unsuccessful, but a small fee being paid for finding water at a workable depth. I would freely grant loans for well construction, payment being spread over a considerable number of years, and almost a total remission being given in case of failure. I would also grant exemption from all enhanced assessment for a fixed period of years varying with the outlay.

40. I reproduce below some extracts from the Final Settlement Report dealing with irrigation in the Nimar District.

The irrigated area has increased by 16 per cent. during the term of settlement. The increase in itself is satisfactory, but though the irrigated area

stood, at the last settlement, at only 3 per cent. of the cultivated area, it has failed to keep pace with general cultivation, and now stands at only 2 per cent.

On the average there are less than 16 acres of irrigated land to each village. In the two groups of old Nimar, which are now in the Harsud tahsil, the average is only half an acre; in the Burhanpur tahsil it is only $7\frac{1}{2}$ acres; but in the Khandwa tahsil it rises to nearly 20 acres. It is the centre of the Khandwa tahsil which has the most irrigation: thus the average irrigated area to each village is—

In the Khandwa group	48 acres.
" " Pandhana "	30 "
" " Gokalgaon "	23 "
" " Barur "	21 "

Three methods of irrigation.

Irrigation is carried on—

- (1) usually from wells,
- (2) occasionally from channels,
- (3) exceptionally from tanks.

Gradual silting-up has been the chief change during the term of settlement in the very few tanks from which irrigation is carried on. The

Lachhora lake at the north-west corner of the district is the only important irrigation tank. In the famine of 1846 numerous small tanks were constructed, but owing, presumably, to faults in the trap-rock on which they rested, the tanks hold little or no water. A few in the Kanapur-Beria pargana near the Lachhora lake retain water, but they serve rather for watering cattle than for irrigation, and are steadily silting up. The whole area irrigated from tanks is less than 500 acres.

In the centre of the Khandwa tahsil, irrigation by channels is not uncommon. A dam of palm trunks and mud holds up the stream, and an earthen channel leads water into the fields which are to be irrigated. The holders of the field combine to set up the dam and repair the channel yearly.

Irrigation from wells is increasing. Unfaced (*kachcha*) wells cost only about Rs. 60 and last in the hard soil for a number of years before the crumbling of the rock makes it necessary to face them at a cost, which for ordinary good facing, runs up to Rs. 300.

In 1896 there were about five thousand wells in the district—643 cut in the rock, 2,251 dug in the soil and lined with brick, and 2,103 merely *kachcha*; but of whole number only two-thirds are in actual use for irrigation. Of the rest, some are falling into disuse, because the sides have caved in; some are simply used for drinking; and some are held in reserve to supplement the ordinary supply.

The first step towards encouraging irrigation is to avoid discouraging it by the imposition of heavy water-rates. It is hardly possible to consider the water-rates taken at the settlement as heavy.

The next step is to determine for what crops more water is wanted. Nimar has an excellent system of *kharif* cultivation, which decidedly ought not to be deserted for *rabi* cultivation. But it is desirable that a cultivator should be able to supplement a deficient monsoon by one timely watering of his *kharif* crops: and a water-supply is needed, which shall ordinarily serve for that corner of the holding on which valuable *rabi* or garden crops are grown, but shall also be sufficient in times of drought to save the *kharif*.

The third step is to take the line of least resistance by encouraging that form of irrigation to which the people are accustomed.

For this reason preference should be given to wells.

Advantages of wells.

There may be, on the flanks of the Satpuras, practicable sites for tanks of the Lachhora type, but considerable difficulties would occur in introducing and regulating the water-supply among cultivators unused to the system. The one advantage which reservoirs, if good, would have over wells, is that they would not fail in dry years; but good reser-

voirs are expensive and apt to pay no interest. The Lachora tank pays interest, but on the cost of repairs only.

As a means of irrigation, channels are inferior to wells, because in a dry year water fails sooner in the streams than in the wells, and channel irrigation has inherent difficulties of organization from which well irrigation is free. It must not be inferred from the apparent ease with which existing channel irrigation is distributed, that Government would find it easy to organize fresh channel irrigation. The friction in the existing schemes is inaudible, because the schemes are so small being village concerns, indeed almost family concerns. Any new scheme must be worked out spontaneously, and Government can do little towards devising or facilitating it. It is true that Government did build two masonry dams on the river Abna; but such reservoirs silt up in time, and the observation and repair of isolated works of this kind is difficult. Wells therefore are the most practicable means of extending irrigation.

They are not universally practicable; for instance,

Difficulties. in the two adjoining villages of Gunjli and Ghosli, in the north-west of the Khandwa Tahsil, Gunjli has substantial irrigation and Ghosli has none, the reason alleged is that the black rock found in Ghosli defies blasting.

Another drawback is that in dry years wells are apt to fail. But greater depth would often bring a sufficient supply of water.

Suggestions.

Government can facilitate well sinking, not only by easy loans but by introducing improved methods of rock blasting. The deepening of wells should be encouraged, and it may be found possible for Government, in the Public Works Department, to improve, by training or by example, the primitive methods of the men who now wander about sinking wells. Either Government employes, working at cost price for individual cultivators, could sink difficult wells by dynamite or other approved method and so create a demand for better work which the ordinary well-sinkers would have to meet, or some ordinary well-sinkers could be trained in improved methods at Government expense.

There was at the time of re-settlement a distinct movement for sinking wells; the dry seasons and possibly the exhortations of the district and settlement staffs had fostered the movement. At present the water-supply in most wells is barely sufficient in dry years for the rabi or garden crops which it usually waters, and the knowledge that all the water will be needed for ordinary purposes prevents the ryots from giving special waterings to their drooping kharif crops. Therefore, deeper wells are needed in addition to new wells. The Chief Commissioner has already (in paragraph 7 of Resolution No. 399, dated the 23rd January 1897, on the Khandwa Tahsil Report) accepted the principle that the conversion of *kachcha* (unlined) wells into *pucca* (lined) wells may be accepted as an improvement involving the usual exemption from enhancement of water-rate, and the *sanads* issued for such conversions were popular. It is worth consideration whether substantial expenditure on deepening a well should not receive, as a matter of course, a certificate declaring any additional area thenceforward irrigated as exempt for the usual time.

41. The character of the soil varies largely in the

Satpura plateau.

Satpura plateau, tracts being round both of sandstone formation and of trap. There is a certain amount of irrigation from wells, which is more common in the sandy than in the black soil, but it is insignificant. Tanks are very uncommon. The average irrigated area is about 9,000 acres in Betul and about 8,000 acres in Chhindwara. The principal crops irrigated are rice, sugarcane and garden crops. Wells can readily be sunk over most of the plateau, the depth of water being usually 20 to 30 feet from the surface. Wells are fairly numerous, many having been sunk in old times for opium and sugarcane cultivation. With the stopping of opium cultivation and the decline of sugarcane, the importance of well irrigation is not now so fully recognized as it was years ago. In Betul wells are common both in the sandstone and trap country. With a normal rainfall no irrigation is necessary for rabi crops: but if the winter rains fail, a watering or two much improves the yield. In the case of wheat there is a risk of rust, and in the case of pulses of frost and cold mist, the damage from which is increased by irrigation. There

is probably much scope for the extension of well irrigation in the plateau districts, which the people may resort to more freely if the seasons continue unfavourable. I would encourage it by the same methods suggested for Nimar. The standard out-turns of the Betul District are 620 lbs. for unirrigated unmanured wheat and 1,000 lbs. for irrigated manured wheat.

42. I reproduce some extracts from the Final Settlement Report of the Betul district which gives the opinion of Mr. B. P. Standen, I.C.S., O.I.E., on irrigation in that district:—

"With a normal rainfall, no irrigation is necessary, but if the winter rains fail, a couple of waterings will vastly improve the crop, will in fact make all the difference between a bumper and a poor crop. No wells are sunk exclusively for the irrigation of rabi crops, and there are no irrigation tanks, but sufficient water for 5 or 6 acres of rabi land can sometimes be spared from the sugarcane well, and there are in a good many villages small streams which can be temporarily dammed and utilized for this purpose. There are also numbers of wells which were originally sunk for sugarcane cultivation, but have been abandoned because a sufficient supply of water was not found, and many of these hold enough water to irrigate a good many acres of rabi. The land record returns for the year 1896-97, in which the rain ceased in August, show only 5,616 acres of rabi crops irrigated, and the average area is only about 4,000 acres. The irrigation of rabi land occupies a few days only, and is often effected after the patwari has completed his annual field to field inspection, and it is probable that some irrigation does not appear in the village papers, but from what I have myself seen during village inspection, I should say that a large area of rabi crop, which could be conveniently watered, is left dry even in those years in which the event shows that irrigation would have been most beneficial.

In the case of land lying under wells, which are used for sugarcane cultivation, this is no doubt often due to want of bullocks, since the watering of a good sized cane garden needs all the labour of four bullocks: moreover, if the rains have been short, the cultivator may be unwilling to risk the depletion of his water supply below the minimum required for his cane land. Then again if the well be a deserted one, not used for sugarcane, it would generally be necessary for the cultivator to spend Rs. 15 or Rs. 20 on the leather bucket and rope and the staging and wheel on which it hangs. The use of stream water involves little or no expenditure, but it is not so much resorted to as it might be. The principal reason is, I think, that there is always a great risk in the case of gram, masur and tiuara, and in the case of wheat a smaller risk, but still a real risk, that irrigation may do more harm than good. The risk in the case of the pulses lies in the frequency of frost and cold mists (known as dhow), of which the injurious effect is heightened by the presence of much moisture in the soil, and which are always most liable to occur in valley bottoms. More frequently than not the pulses are damaged to some extent in one tract or another from these cold mists, and wheat often suffers in a less degree. In the case of wheat a further risk lies in the possibility that heavy winter rains may fall after the crop has been watered, and the excess of moisture may result in a kind of black rust known as "kani." I have seen an otherwise splendid crop ruined in this way. But the disease is not often seen.

In some villages of the Multai tahsil lying on the central trap plateau, the sub-soil water is very near the surface, and there are wells in which the hot-weather level of the water

Sugarcane wells.

is not more than 8 or 10 feet below the surface. But the average hot-weather level of well-water in that part of the district is about 20 to 30 feet. Elsewhere the water is generally deeper, and wells of 50 to 60 feet are not uncommon. In the deep black soil of the 54 open villages round Betul and the few villages lying in the basins of excellent land round Atnar and Dhaidehi in the south of the Betul tahsil, as well as in the sandy villages on the north bank of the Bel, the depth of the soft soil makes it necessary to shore the

Mr.
F. G. Stg.
5 Mar. 02

Mr.
F. G. Sly.
5 Mar. 02.

well tube with brick. But in that part of the district where sugarcane is most largely grown, namely, the undulating trap plateau, the formation is such that durable wells can be made without the use of brick and lime. The sugarcane gardens are found in valleys, many of which are very narrow. The soil in the centre is fairly deep, but it becomes continually shallower as it approaches the hills on each side. As a rule there is not more than 8 or 9 feet of soil in the deepest parts, and at the foot of the surrounding slopes the bed rock or muram is scarcely covered. In such land it is usual to shore with unshaped stones from the hill side only so much of the shaft as passes through the black soil on the surface. The underlying muram or rock requires no support. The length of time for which a well of this kind will last depends principally on the nature of this substratum, known locally as "nio." A projecting ledge of the muram or rock is left in the shaft at the point where the black soil meets it, and the stones which support the walls of the upper part of the well tube rest thereon. If the material be not hard enough, the constant dripping of the water from the "môt" wears it away, and in 4 or 5 years the cultivator has to spend a few rupees in strengthening the threatened portion of the wall. In some wells the underlying rock is so hard that the wells require no attention for many years. Wells are now very rarely shored with timber, though judging from Mr. Ramsay's report such wells were common at settlement. The cost of digging a well depends on so many contingencies, that it is difficult to estimate an average, but the maximum and minimum expenditure which is incurred in wells of the different classes and the circumstances which affect the cost may be stated. A durable bricked well in soft deep soil cannot be made for less than Rs. 100, and if the water be very deep and the shaft fall in once or twice before it can be supported with its brick tubings, the expenditure may amount to Rs. 400 or Rs. 500. The stoneshored wells of the Multai tahsil can be made for Rs. 15 or Rs. 20 if the water be not more than 12 or 15 feet below the surface, and the underlying rock or muram be not excessively hard. I think the most expensive of these wells never costs more than Rs. 200. To pierce moderately hard rock the cultivators light a fire of cow-dung cakes on the rock, and when it is very hot, pour water on it, so that it cracks in all directions and is then broken up with crowbars. If it will not yield to this treatment, it is blasted with gunpowder. The earth and debris removed from the shaft is used to form an inclined plane called "dhao" on which the bullocks walk. This serves a double purpose. It lightens the labour of the cattle and enables the cultivator to raise the water to a level much higher than the mouth of the well, thus enabling him to irrigate a larger area. Sometimes if it is desired to irrigate land lying at a considerably higher level than the well, the cultivator makes a hole (known as *bhurka*) at the highest level to which he can carry water from the well, and he fills the *bhurka* from the well, and then with the help of another "dhao" raises the water to a level several feet higher than the mouth of the *bhurka*. By this duplex arrangement the water is sometimes raised as much as 20 feet above the level of the mouth of the well. Some more remarks on the subject of sugarcane wells will be found in Part II of this report in the paragraphs regarding the exemption of improvements from assessments. Experiments show that one man working with two pairs of bullocks and one "môt" or leather bucket can raise about 66 tons of water in a working day of 10 hours from a well 30 to 35 feet deep.

43. Next I reproduce the remarks made in his Final Settlement Report by Mr. Montgomery on irrigation in the Chhindwara district:—

The only crops which are irrigated in the district are vegetables, spices and sugarcane. One exception—
Absence of irrigation. a very small exception—
this rule is wheat, but an irrigated wheat-field is as rare as a correct statement of siwai income. Fruit-trees, also, are watered.

It is natural that in the Chhindwara tahsil irrigation should have made little progress, for the cultivator who desired a large outturn simply took up more land from the culturable waste. In the thickly populated tracts below the ghats, irrigation might be expected to make progress; but the system of cultivation in which the cultivators of the Sausar tahsil are skilful does not include irrigation, and the low countryman who wishes for a larger outturn increases the care paid to cultivating his existing fields, if he

cannot get fresh land. Further, the amount of water tapped by a well is said to be less below the ghats than it is above the ghats. Such irrigation as exists is carried on from wells, or in rare cases from water-holes (*bhurkas*) dug at the foot of a bank overhanging a stream. In either case the water is lifted in a circular leather bag (*môt*) attached by a rope running over a pulley to the yoke of a pair of oxen, which lift the water-bag as they pace down an inclined run, and return backwards up the slope when the water-bag. When the bag is ascending, descending, which receives the water commences just at the head of the inclined run, and leads the water off to one side. The main rope runs on a pulley over a bar fixed about four feet above the top of the run; an auxiliary rope runs over a roller fixed at the beginning of the discharging channel and is fastened to the mouth of a leather tube inserted at the bottom of the water-bag. When the bag is ascending, descending, or stationary in the water, the auxiliary rope holds up the mouth of the leather tube, so that no water can escape from the bag; but when the bag is drawn right up to the pulley, the auxiliary rope at a lower level guides the mouth of the tube over the roller into the discharging channel and the water is free to rush out through the tube.

Irrigation by a channel led from a dam on a stream or from a tank is so rare that it is not worth consideration.

In no assessment group does the irrigated area amount to more than 2 per cent. of the total area. In the Chhindwara tahsil, the irrigated tract, starting at the west of the Samaswara group, extends along the top of the ghats through the Chand and Mokher groups; half-way along the top of the ghats it trends to the north-west and covers the open yellow-soil villages on the west of the Chhindwara group and the east of the Umreth group. In the north-east of the tahsil, round about Amarwara Khas village, there is a cluster of villages in which irrigation for sugarcane prevails. Below the ghats, in the Sausar tahsil, the best irrigated tract is the Pandhurna valley, which includes the small Chicholi group and the centre of the Pandhurna group, and is, as regards soil, not unlike the irrigated tract above the ghats. In the valley of the Jam river, also, there is a group of villages in which irrigation is practised.

Small as is the irrigated area, it has actually decreased since the last settlement, except in the villages of the yellow-soil area west of Chhindwara town. The decrease is due to the decay of sugarcane growing.

44. In Jubbulpore the rice tracts are mostly situated in the Murwara and the Sehora tahsils. Rice is generally grown on sandy soil. It is practically all broadcasted and not irrigated. In Mandla rice is mostly grown in the sandy villages to the south, the rice on rich black soil being often swamped. There are few tanks, although the formation of the country does not seem unsuited to them. The rice is practically all broad-cast and unirrigated. The irrigated area in Mandla has never exceeded 1,200 acres. Under such conditions the outturn is naturally low, being 850 lbs. per acre for each district. If irrigation works are started in these tracts, it is evident that for some years the water-rate must be pitched very low indeed until the cultivators are accustomed to irrigation and better methods of cultivation. I have no knowledge of these parts which would justify my expressing any opinion as to the possibilities of extending irrigation.

45. The agricultural conditions of these two districts are very similar. They are both essentially wheat-growing tracts, wheat and its mixtures covering over 50 per cent. of the cropped area. The rabi crops are grown in black soil, regarding the irrigation of which my former remarks apply. For ten years prior to 1892, the rabi crops suffered almost continuously from excessive rainfall. In Saugor rice is mostly grown in small plots round the villages, which often bear a double crop. In Damoh rice is more largely grown in sandy valleys amongst the hills, where there may be scope for irrigation. In both districts it is practically all broad-cast and unirrigated. The cultivation of sugarcane has declined, but for reasons other than those connected with irrigation. Irrigation is quite insignificant in both districts, the average being about 7,000 acres in Saugor and 2,500 acres in Damoh. The standard outturns of rice are 900 lbs. in Saugor and 800 lbs. in Damoh. The wheat outturns are 600 lbs. in Saugor and 500 lbs. in Damoh. It may be possible that there is scope for the extension of well-irrigation, but I have no knowledge of the tract.

List of Appendices.

- A. Statement showing the rainfall in each district of the Central Provinces.
 - B. Statement showing the progress of irrigation in each district of the Central Provinces.
 - C. Statement showing the area under each of the principal irrigated kharif crops in each district of the Central Provinces.
 - D. Statement showing the principal irrigated rabi crops in each district of the Central Provinces.
 - E. Statement showing the amount of loans made under the Land Improvement Loans Act.
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STATEMENT A.—Showing the Rainfall

Districts.	Year.	EARLY MONSOON.				Late	
		June.	July.	August.	Total.	September.	October.
1	2	3	4	5	6	7	8
		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Saugor . . .	1896-97	8.60	11.43	15.20	35.23	.07	...
	1899-1900	5.26	12.80	3.06	21.12	1.40	...
	Average of 32 years preceding	7.28	16.35	13.26	36.89	7.60	1.22
Damoh . . .	1896-97	11.19	17.76	19.95	48.90	3.05	...
	1899-1900	7.10	13.70	6.96	27.76	1.50	...
	Average of 32 years preceding	6.04	18.05	13.65	37.74	9.28	1.78
Jubbulpore . . .	1896-97	15.07	21.93	26.93	63.93	.37	...
	1899-1900	4.34	18.46	7.57	30.37	3.51	...
	Average of 32 years preceding	9.71	19.16	15.74	44.61	9.99	1.54
Mandla . . .	1896-97	8.01	22.58	21.43	52.02	3.18	...
	1899-1900	6.14	11.32	7.35	24.81	2.78	...
	Average of 32 years preceding	10.16	16.39	14.57	41.12	6.28	1.46
Seoni . . .	1896-97	13.44	16.81	15.66	45.91	.75	...
	1899-1900	6.75	10.03	3.60	20.38	1.53	...
	Average of 32 years preceding	10.56	15.84	12.86	39.26	8.67	1.88
Narsinghpur . . .	1896-97	11.38	14.46	18.07	43.91	1.69	...
	1899-1900	3.29	7.76	11.13	22.18	.97	...
	Average of 32 years preceding	10.11	15.08	14.76	39.95	8.07	1.29
Hoshangabad . . .	1896-97	11.02	13.30	18.42	42.74	.17	...
	1899-1900	6.27	9.14	4.62	20.03	1.95	...
	Average of 32 years preceding	8.55	14.95	15.48	38.98	8.31	1.54
Nimar . . .	1896-97	8.28	14.76	10.41	33.45	...	...
	1899-1900	2.57	3.05	1.95	7.57	.50	.02
	Average of 32 years preceding	6.92	8.88	8.23	24.08	5.73	1.06
Betul . . .	1896-97	12.87	13.49	15.96	42.32	.04	...
	1899-1900	2.82	5.69	1.86	10.37	.35	...
	Average of 32 years preceding	8.74	13.65	11.98	34.37	7.32	2.34
Chhindwara . . .	1896-97	8.37	14.25	6.79	29.41	...	...
	1899-1900	2.66	4.42	3.29	10.37	.91	.18
	Average of 32 years preceding	9.56	11.08	7.60	28.24	9.42	2.03
Wardha . . .	1896-97	4.59	12.23	16.91	33.73	...	...
	1899-1900	2.50	1.09	6.34	9.93	2.88	...
	Average of 32 years preceding	7.68	12.58	8.01	28.27	8.32	2.27
Nagpur . . .	1896-97	11.96	17.97	18.33	48.26	2.30	...
	1899-1900	4.94	3.54	2.69	11.17	2.04	...
	Average of 32 years preceding	9.73	13.57	9.73	33.03	9.01	2.22
Chanda . . .	1896-97	9.51	19.75	21.62	50.88	3.89	...
	1899-1900	4.63	1.92	11.40	17.95	.97	...
	Average of 32 years preceding	8.50	16.30	13.30	38.60	7.76	1.89
Bhandara . . .	1896-97	12.54	22.35	24.93	59.82	.65	...
	1899-1900	4.75	3.21	9.30	17.26	4.02	...
	Average of 32 years preceding	10.87	15.97	13.92	40.76	9.75	1.52

in each District of the Central Provinces.

MONSOON.		COLD WEATHER.				HOT WEATHER.				Grand total for the year.
November.	Total.	December.	January.	February.	Total.	March.	April.	May.	Total.	
9	10	11	12	13	14	15	16	17	18	19
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
.05	.12	1.28	1.81	...	3.09	...	.09	...	.09	38.53
...	1.40	...	.52	...	.52	...	.10	.11	.21	23.25
.26	9.08	.58	.65	.30	1.53	.29	.12	.34	.75	48.25
.66	3.71	.89	.95	...	1.84	...	.15	.09	.24	54.69
...	1.50	...	.84	...	.84	...	...	.19	.19	30.29
.21	11.27	.46	.40	.50	1.36	.28	.21	.26	.75	51.12
.31	.68	.75	2.10	.15	3.00	.17	.72	.23	1.12	68.78
...	3.51	...	2.31	...	2.31	...	.61	.10	.71	36.90
.42	11.95	.80	.63	.34	1.77	.50	.24	.49	1.23	59.56
.39	3.57	1.15	2.22	1.62	4.99	.21	.57	.15	.93	61.51
...	2.78	...	2.90	...	2.90	...	.22	.03	.25	30.74
.40	8.14	.35	.58	.63	1.51	.96	.40	.56	1.92	52.69
.94	1.69	.38	1.69	.90	2.97	.20	.67	.72	1.59	52.16
...	1.53	...	.54	.36	.90	.04	.39	.34	.77	23.58
.54	11.09	.47	.58	1.02	2.07	.58	.42	.55	1.55	53.97
.68	2.37	1.05	1.89	.28	3.13	.02	.27	.07	.36	49.77
...	.97	...	1.71	...	1.71	...	.27	.09	.36	25.22
.39	9.75	.33	.48	.50	1.31	.37	.10	.29	.76	51.77
.01	.13	.66	.77	.05	1.48	...	.04	...	.04	44.44
...	1.95	...	.36	...	.36	...	.04	...	.04	22.38
.88	10.23	.63	.27	.21	1.16	.14	.10	.48	.72	51.09
...	...	.42	.40	...	.82	...	.01	...	.01	34.28
...	.52	...	.26	...	.26	...	...	.04	.04	8.39
.22	7.00	.32	.33	.25	.90	.11	.13	.32	.56	32.54
.14	.18	2.35	1.80	.09	4.24	...	.06	.09	.15	48.89
...	.35	...	.26	.15	.41	...	.02	.10	.12	11.25
.56	10.22	.45	.49	.24	1.18	.58	.23	.41	1.17	46.94
1.28	1.28	.15	2.15	.21	2.51	.04	.16	...	.20	33.40
...	1.09	...	.41	.07	.48	...	2.25	.08	2.33	14.27
.61	12.06	.35	.80	.40	1.55	.44	.32	.48	1.24	43.09
1.34	1.34	.12	.60	.44	1.16	.47	.02	.83	1.32	37.55
...	2.58	...	.07	.02	.09	.12	.28	...	.40	19.30
.59	11.18	.38	.39	.81	1.08	.46	.31	.69	1.46	41.99
.57	2.87	.14	.66	.20	1.00	.15	.56	.18	.89	53.02
...	2.04	...	...	.48	.48	...	.12	.14	.26	13.95
.54	11.77	.34	.66	.41	1.41	.32	.36	.47	1.15	47.36
2.68	6.57	...	.02	.06	.08	1.61	2.20	.33	4.14	64.07
...	.97	...	.09	...	.09	.10	.53	.37	1.00	20.01
.57	10.22	.30	.32	.36	.98	1.06	.55	.61	2.22	52.02
1.50	2.15	.21	.34	.17	.72	...	.74	.09	.83	63.52
...	4.02	...	.16	2.29	2.45	.63	.75	.09	1.47	25.20
.62	11.89	.33	.63	.36	1.32	.61	.82	.56	1.99	55.96

STATEMENT A.—Showing the Rainfall

DISTRICTS.	Year.	EARLY MONSOON.				Late	
		June.	July.	August.	Total.	September.	October.
1	2	3	4	5	6	7	8
		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Balaghat	1896-97	11.43	22.52	16.70	50.65	1.18	...
	1899-1900	5.27	11.10	11.97	28.34	1.59	...
	Average of 32 years preceding	12.81	19.20	15.99	48.00	10.29	1.85
Raipur	1896-97	12.71	20.48	26.62	59.81	3.47	...
	1899-1900	3.79	6.55	11.00	21.34	1.08	...
	Average of 32 years preceding	11.13	14.76	13.52	39.41	6.79	1.88
Bilaspur	1896-97	12.61	25.73	18.58	56.92	1.41	...
	1899-1900	3.77	7.82	20.74	32.33	.90	...
	Average of 32 years preceding	9.42	14.31	11.28	35.01	8.20	1.82
Sambalpur	1896-97	22.90	37.91	19.06	79.27	4.84	...
	1899-1900	10.19	23.63	10.40	44.22	1.29	...
	Average of 32 years preceding	9.28	18.70	15.66	43.64	9.12	1.98



in each District of the Central Provinces—*concl'd.*

MONSOON.		COLD WEATHER.				HOT WEATHER.				Grand total for the year.
November.	Total.	December.	January.	February.	Total.	March.	April.	May.	Total.	
9	10	11	12	13	14	15	16	17	18	19
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1.25	2.43	...	1.10	.07	1.17	.35	.60	1.15	2.10	56.35
...	1.59	...	1.14	1.02	2.16	...	.41	.58	.99	33.08
.50	12.64	.25	.27	.48	1.00	.43	.35	.64	1.42	63.06
1.74	5.21	...	.45	.81	1.26	.57	.75	.63	1.95	68.23
...	1.08	...	.56	.61	1.17	.32	.37	.89	1.58	25.17
.38	9.05	.23	.32	.28	.83	.65	.56	5.51	6.72	56.01
1.79	3.20	...	.58	1.80	2.38	2.31	4.81	.78	7.90	70.40
...	.90	...	.96	.05	1.01	.04	.61	.45	1.10	35.34
.62	10.64	.29	.41	.42	1.12	.65	.94	1.13	2.72	49.49
.78	5.57	...	.15	.77	.92	2.38	2.24	1.31	5.93	91.69
...	1.29	...	.38	...	.38	.12	.94	1.60	2.66	48.55
.42	11.47	.16	.48	.43	1.07	.83	.44	1.26	2.53	58.71



STATEMENT B.—Showing the Progress of Irrigation in each District of the Central Provinces during the years 1890-91 to 1900-01.

DISTRICTS.	Year.	IRRIGATION.				NUMBER OF IRRIGATION WELLS.		Number of artificial irrigation tanks.
		AREA IRRIGATED FROM				Temporary.	Durable.	
		Wells.	Tanks.	Other sources.	Total.			
1	2	3	4	5	6	7	8	9
		Acres.	Acres.	Acres.	Acres.			
Saugur	1890-91	5,723	227	1,635	7,585	2,852	316	22
	1891-92	4,876	219	2,429	7,524	2,305	1,123	46
	1892-93	5,335	478	2,066	7,879	2,093	1,535	35
	1893-94	5,425	152	358	5,965	1,411	1,802	8
	1894-95	5,700	203	407	6,310	1,895	1,795	23
	1895-96	5,668	238	434	6,360	1,663	1,986	16
	1896-97	5,892	194	495	6,521	1,444	1,839	15
	1897-98	5,546	183	209	5,943	1,279	2,053	13
	1898-99	5,861	41	785	6,687	1,382	1,889	19
	1899-1900	5,941	88	553	6,582	1,477	2,093	2
	1900-01	6,307	147	616	7,070	1,631	1,656	12
Damoh	1890-91	3,179	123	193	3,495	492	555	153
	1891-92	1,438	550	304	2,292	44	646	87
	1892-93	1,528	344	589	2,461	474	541	81
	1893-94	1,431	373	600	2,404	358	753	49
	1894-95	1,495	229	447	2,171	391	758	45
	1895-96	1,631	166	391	2,188	379	743	33
	1896-97	1,559	97	364	2,020	343	723	25
	1897-98	1,400	111	347	1,858	323	635	17
	1898-99	1,418	228	212	1,918	292	641	22
	1899-1900	1,520	22	430	1,972	266	688	9
	1900-01	1,625	17	460	2,102	294	695	14
Jubbulpore	1890-91	2,533	...	...	2,533	1,310	679	39
	1891-92	2,416	...	...	2,416	116	634	17
	1892-93	2,648	...	...	2,648	819	678	13
	1893-94	2,298	58	294	2,650	836	675	12
	1894-95	2,351	78	473	2,902	1,293	984	38
	1895-96	2,555	68	463	3,086	1,362	1,132	27
	1896-97	2,738	181	280	3,199	1,312	1,077	22
	1897-98	2,468	56	295	2,819	1,200	963	21
	1898-99	2,116	59	396	2,571	1,133	1,026	18
	1899-1900	2,508	51	578	3,137	1,367	1,150	21
	1900-01	2,334	55	452	2,841	1,328	1,097	27
Mandla	1890-91	340	560	296	1,196	336	4	205
	1891-92	340	560	296	1,196	336	4	205
	1892-93	340	560	296	1,196	336	4	205
	1893-94	340	560	296	1,196	336	4	205
	1894-95	340	560	296	1,196	336	4	205
	1895-96	444	50	584	1,078	350	25	3
	1896-97	567	8	459	1,034	...	...	...
	1897-98	589	20	469	1,078	513	20	13
	1898-99	560	20	347	927	356	19	4
	1899-1900	326	30	453	809	521	37	5
	1900-01	372	30	582	934	231	40	2

STATEMENT B.—Showing the Progress of Irrigation in each District of the Central Provinces during the years 1890-91 to 1900-01—*contd.*

DISTRICTS.	Year.	IRRIGATION.				NUMBER OF IRRIGATION WELLS.		Number of artificial irrigation tanks.
		AREA IRRIGATED FROM				Temporary.	Durable.	
		Wells.	Tanks.	Other sources.	Total.			
1	2	3	4	5	6	7	8	9
		Acres.	Acres.	Acres.	Acres.			
Seoni	1890-91	1,836	21,597	1	23,434	699	268	836
	1891-92	1,224	30,644	401	32,269	1,595	605	441
	1892-93	1,015	21,920	1,444	24,379	651	207	461
	1893-94	995	25,799	333	27,127	728	388	532
	1894-95	2,103	23,508	1,692	27,303	948	382	2,411
	1895-96	442	26,015	1,158	27,615	1,190	420	563
	1896-97	1,435	19,480	162	21,077	1,208	429	560
	1897-98	811	18,014	443	19,268	819	226	671
	1898-99	894	20,888	1,939	23,721	1,017	265	765
	1899-1900	711	1,190	591	2,492	829	222	372
	1900-01	445	13,608	522	14,575	933	340	656
Total Jubbulpore Division	1890-91	13,616	22,507	2,125	38,248	5,689	1,822	1,260
	1891-92	10,294	31,973	3,430	45,697	5,844	3,012	796
	1892-93	10,866	23,302	4,395	38,563	4,403	2,965	795
	1893-94	10,489	26,942	1,911	39,342	3,669	3,622	806
	1894-95	11,989	24,578	3,315	39,882	4,363	3,923	2,722
	1895-96	10,760	26,537	3,030	40,327	4,964	4,311	647
	1896-97	12,181	19,960	1,760	33,851	4,307	4,068	623
	1897-98	10,814	18,389	1,763	30,966	4,134	3,897	740
	1898-99	10,879	21,236	3,709	35,824	4,180	3,850	823
	1899-1900	11,066	1,381	2,605	14,992	4,460	4,190	409
	1900-01	11,083	13,857	2,632	27,572	4,517	3,828	711
Narsinghpur	1890-91	1,743	...	552	2,295	311	179	...
	1891-92	1,916	...	660	2,576	467	307	...
	1892-93	1,736	...	497	2,233	451	277	...
	1893-94	1,697	...	483	2,180	421	279	...
	1894-95	1,776	3	578	2,357	723	437	3
	1895-96	2,525	1	447	2,973	1,042	581	1
	1896-97	3,019	7	540	3,566	1,147	599	2
	1897-98	2,944	1	196	3,141	1,025	506	2
	1898-99	1,990	1	315	2,306	774	485	1
	1899-1900	2,435	1	290	2,666	815	522	1
	1900-01	2,548	1	295	2,844	875	539	1
Hoshangabad	1890-91	2,971	...	139	3,110	635	493	1
	1891-92	3,143	5	156	3,304	745	575	2
	1892-93	2,450	...	692	3,142	434	469	...
	1893-94	2,519	2	372	2,893	547	570	1
	1894-95	2,363	2	296	2,661	471	505	2
	1895-96	2,915	...	592	3,507	614	574	...
	1896-97	3,276	...	722	3,998	685	564	...
	1897-98	2,743	...	395	3,143	639	524	...
	1898-99	2,850	1	296	3,147	663	530	1
	1899-1900	3,668	...	442	4,110	1,060	621	...
	1900-01	4,163	12	399	4,579	1,073	747	1

STATEMENT B.—Showing the Progress of Irrigation in each District of the Central Provinces during the years 1890-91 to 1900-01—contd.

DISTRICTS.	Year.	IRRIGATION.				NUMBER OF IRRIGATION WELLS.		Number of artificial irrigation tanks.
		AREA IRRIGATED FROM				Temporary.	Durable.	
		Wells.	Tanks.	Other sources.	Total.			
1	2	3	4	5	6	7	8	9
		Acres.	Acres.	Acres.	Acres.			
Nimar	1890-91	10,534	124	5	10,663	1,910	1,011	1
	1891-92	13,019	196	32	13,247	2,077	1,116	1
	1892-93	13,232	257	1,038	14,627	1,961	1,067	1
	1893-94	13,012	224	1,059	14,295	2,083	1,139	1
	1894-95	11,308	156	787	12,251	2,057	1,232	1
	1895-96	11,315	162	725	12,202	2,057	1,233	1
	1896-97	10,141	164	706	11,011	1,659	1,261	1
	1897-98	12,524	212	1,016	13,752	2,025	1,407	3
	1898-99	13,041	144	917	14,102	2,124	1,449	2
	1899-1900	5,266	...	43	5,309	1,917	1,415	...
	1900-01	14,369	...	528	14,897	2,513	1,806	3
Betul	1890-91	8,914	...	8	8,922	4,127	1,260	...
	1891-92	9,502	...	433	9,935	4,130	1,261	...
	1892-93	11,800	...	692	12,492	4,140	1,264	...
	1893-94	7,847	...	...	7,847	3,613	2,196	...
	1894-95	7,545	...	...	7,545	3,251	2,257	...
	1895-96	8,087	...	40	8,127	3,098	1,929	...
	1896-97	9,568	...	2,463	12,056	2,907	2,030	...
	1897-98	8,001	...	308	8,309	3,333	2,035	...
	1898-99	9,002	...	868	9,870	3,275	2,058	...
	1899-1900	6,700	...	77	6,777	3,249	2,102	..
	1900-01 . . . . .	...	...	...	...	...	...	...
Chhindwara	1890-91	7,003	3	72	7,078	3,402	432	10
	1891-92	8,273	36	261	8,570	3,441	450	10
	1892-93	7,560	20	190	7,770	3,237	327	12
	1893-94	5,170	12	96	5,278	3,237	373	12
	1894-95	5,292	11	103	5,411	3,211	326	12
	1895-96	7,583	2	263	7,853	3,494	378	12
	1896-97	8,981	5	296	9,282	7,252	373	7
	1897-98	8,430	105	342	8,877	4,473	378	9
	1898-99	6,001	139	2,316	8,456	4,454	336	8
	1899-1900	6,579	...	123	6,702	4,031	397	8
	1900-01	7,786	31	320	8,137	4,052	422	8
Total Nerbudda Division	1890-91	31,165	127	776	32,068	10,385	3,375	12
	1891-92	35,853	237	1,542	37,632	10,360	3,709	13
	1892-93	36,828	277	3,159	40,264	10,273	3,404	13
	1893-94	30,245	238	2,010	32,493	9,951	4,557	14
	1894-95	28,284	172	1,769	30,225	9,713	4,757	13
	1895-96	32,425	165	2,072	34,662	10,305	4,650	14
	1896-97	35,005	176	4,732	39,913	13,650	4,827	10
	1897-98	34,647	318	2,257	37,222	11,495	4,350	14
	1898-99	32,884	235	4,712	37,831	11,295	4,908	12
	1899-1900	24,648	1	915	25,564	11,122	5,057	9
	1900-01	36,521	44	2,349	38,914	11,715	5,659	13

STATEMENT B.—Showing the Progress of Irrigation in each District of the Central Provinces during the years 1890-91 to 1900-01—contd.

DISTRICTS.	Year.	IRRIGATION.				NUMBER OF IRRIGATION WELLS.		Number of artificial irrigation tanks.
		AREA IRRIGATED FROM				Temporary.	Durable.	
		Wells.	Tanks	Other sources.	Total.			
1	2	3	4	5	6	7	8	9
		Acres.	Acres.	Acres.	Acres.			
Wardha	1890-91	2,621	20	20	2,661	464	515	2
	1891-92	2,971	42	14	3,027	701	581	4
	1892-93	2,855	31	34	2,920	450	626	3
	1893-94	2,444	30	26	2,500	516	636	2
	1894-95	2,384	18	...	2,402	644	522	2
	1895-96	2,788	51	1	2,840	826	521	4
	1896-97	3,859	34	64	3,957	1,155	671	11
	1897-98	3,127	17	5	3,149	1,026	626	3
	1898-99	2,808	14	21	2,843	995	510	5
	1899-1900	2,586	...	3	2,589	1,028	660	
1900-01	3,541	...	7	3,548	1,405	885	1	
Nagpur	1890-91	12,122	12,396	1,584	33,102	3,479	1,007	311
	1891-92	8,915	9,616	4	18,535	295	797	416
	1892-93	10,594	12,548	...	23,142	3,403	773	665
	1893-94	9,948	12,136	211	22,195	3,233	773	667
	1894-95	9,487	13,409	100	22,996	3,322	782	683
	1895-96	10,465	13,340	23	23,831	3,765	1,036	1,106
	1896-97	10,343	13,764	17	24,124	4,241	1,036	1,106
	1897-98	10,584	13,752	52	24,388	4,763	1,115	1,184
	1898-99	10,127	14,653	74	24,854	4,483	1,054	1,307
	1899-1900	9,875	372	60	10,307	5,070	1,187	1,152
1900-01	10,701	11,133	151	21,985	4,877	1,255	1,153	
Chanda	1890-91	7,578	130,011	10,728	148,317	708	225	4,000
	1891-92	7,627	128,772	10,005	146,404	718	225	4,000
	1892-93	8,192	134,401	5,719	148,312	1,792	266	5,123
	1893-94	8,428	133,820	5,320	147,568	1,690	216	5,206
	1894-95	2,705	144,064	2,086	148,855	1,675	302	5,877
	1895-96	2,778	142,637	1,941	147,406	1,647	305	6,402
	1896-97	2,482	154,944	2,096	159,472	1,861	314	6,982
	1897-98	2,302	151,938	3,017	157,807	1,763	296	5,069
	1898-99	2,682	156,690	4,015	163,387	1,507	313	5,861
	1899-1900	2,206	22,315	2,033	26,554	1,720	302	50
1900-01	2,044	72,012	2,980	77,036	1,695	345	5,358	
Bhandara Khalsa	1890-91	5,130	100,743	1,183	167,056	1,053	225	4,300
	1891-92	4,360	145,650	1,223	151,233	917	184	3,030
	1892-93	4,360	145,650	1,223	151,233	917	184	3,030
	1893-94	9,783	154,566	203	164,552	995	232	6,145
	1894-95	6,304	137,994	1,477	145,775	912	217	5,421
	1895-96	2,090	143,640	1,313	147,043	1,218	302	6,980
	1896-97	2,246	135,159	2,584	139,989	1,303	269	6,957
	1897-98	2,197	130,961	2,222	135,380	1,211	258	7,386
	1898-99	2,337	148,271	1,932	152,540	1,182	309	8,688
	1899-1900	1,977	28,301	320	30,598	1,334	334	6,889
1900-01	2,308	105,798	1,242	109,343	463	393	7,883	

STATEMENT B.—Showing the Progress of Irrigation in each District of the Central Provinces during the years 1890-91 to 1900-01—contd.

DISTRICTS.	Year.	IRRIGATION.				NUMBER OF IRRIGATION WELLS.		Number of artificial irrigation tanks.
		AREA IRRIGATED FROM				Temporary.	Durable.	
		Wells.	Tanks.	Other sources.	Total.			
1	2	3	4	5	6	7	8	9
		Acres.	Acres.	Acres.	Acres.			
Bhandara Zamindaris	1890-91	400	90,876	56	91,331	136	41	1,270
	1891-92	1,170	105,968	64	107,202	136	41	1,270
	1892-93	400	90,875	56	91,331	136	41	1,270
	1893-94	2,413	110,027	4	112,444	233	109	3,187
	1894-95	1,309	93,850	416	95,575	163	110	2,864
	1895-96	126	98,627	563	99,321	181	225	3,055
	1896-97	359	75,825	294	76,478	440	100	5,769
	1897-98	235	59,475	386	60,096	215	66	3,442
	1898-99	419	89,072	752	90,243	326	116	5,553
	1899-1900	351	14,201	26	14,578	329	122	3,827
1900-01	541	59,677	310	60,528	339	118	5,678	
Balaghat Khalsa	1890-91	6,959	58,753	384	66,101	1,077	23	942
	1891-92	3,211	72,949	128	76,288	2,356	275	1,731
	1892-93	13,085	70,399	...	83,484	2,393	303	1,899
	1893-94	2,223	82,792	...	85,020	3,052	579	2,081
	1894-95	2,404	80,911	...	83,315	3,147	599	2,203
	1895-96	2,693	74,343	752	77,988	2,044	391	1,567
	1896-97	1,670	45,564	1,061	48,295	2,238	688	2,479
	1897-98	1,489	44,419	978	46,886	1,925	671	2,110
	1898-99	1,585	57,086	1,474	60,145	2,319	745	2,464
	1899-1900	1,648	10,693	463	12,804	2,245	642	2,268
1900-01	1,503	30,229	490	32,222	2,170	724	2,071	
Balaghat Zamindaris	1890-91	802	13,771	...	14,663	646	33	252
	1891-92	903	15,792	42	16,737	847	360	495
	1892-93	5,045	13,579	...	18,624	775	60	505
	1893-94	1,424	19,401	...	20,825	833	66	581
	1894-95	1,452	18,231	...	19,683	860	72	599
	1895-96	1,106	13,703	559	20,368	763	61	639
	1896-97	2,421	7,699	124	10,244	437	55	369
	1897-98	493	4,353	95	4,941	449	34	414
	1898-99	617	7,169	380	8,166	604	52	648
	1899-1900	579	2,354	453	3,386	533	41	490
1900-01	612	2,108	153	2,873	669	54	360	
Total Nagpur Division	1890-91	35,702	473,574	13,955	523,231	7,563	2,069	11,077
	1891-92	29,157	473,789	11,480	519,426	8,970	2,463	10,946
	1892-93	44,531	467,483	7,032	519,046	9,866	2,253	12,495
	1893-94	36,563	512,772	5,764	555,104	10,552	2,641	17,869
	1894-95	26,045	488,477	4,079	518,601	10,723	2,604	17,640
	1895-96	22,246	491,391	5,160	518,797	10,444	2,841	13,703
	1896-97	23,330	432,939	6,240	462,559	11,675	3,133	23,673
	1897-98	20,427	404,965	6,755	432,147	11,352	3,066	20,408
	1898-99	20,725	472,955	8,648	502,328	11,416	3,099	21,525
	1899-1900	19,222	78,236	3,358	100,816	12,259	3,288	14,675
1900-01	21,245	280,957	5,533	307,535	11,618	3,774	22,504	

STATEMENT B.—Showing the Progress of Irrigation in each District of the Central Provinces during the years 1890-91 to 1900-01—*contd.*

Districts.	Year.	IRRIGATION.				NUMBER OF IRRIGATION WELLS.		Number of artificial irrigation tanks.
		AREA IRRIGATED FROM				Temporary.	Durable.	
		Wells.	Tanks.	Other sources.	Total.			
1	2	3	4	5	6	7	8	9
		Acres.	Acres.	Acres.	Acres.			
Raipur Khalsa	1890-91 . . .	7,050	15,050	5,018	27,118	5,276	209	2,048
	1891-92 . . .	3,745	20,944	2,647	27,336	55	316	1,693
	1892-93 . . .	3,716	13,791	4,456	21,963	5,708	296	1,759
	1893-94 . . .	4,785	13,607	2,330	20,722	6,393	197	1,638
	1894-95 . . .	4,819	13,124	3,445	21,388	7,038	222	1,433
	1895-96 . . .	3,931	28,764	3,384	36,079	7,311	210	1,687
	1896-97 . . .	6,557	42,420	13,050	62,027	6,324	320	2,330
	1897-98 . . .	6,220	22,593	10,760	39,573	6,707	516	2,336
	1898-99 . . .	7,861	16,804	7,350	32,015	6,907	369	2,153
	1899-1900 . . .	2,755	17,995	2,041	22,791	5,106	246	1,462
	1900-01 . . .	2,172	9,242	1,102	12,516	2,585	157	1,440
Raipur Zamindaris	1890-91 . . .	...	...	...	..	..	...	...
	1891-92 . . .	42	121	117	280	2	5	4
	1892-93 . . .	721	95	35	851	351	11	53
	1893-94 . . .	...	...	Included in Khalsa.		...	...	...
	1894-95 . . .	705	233	127	1,065	603	10	30
	1895-96 . . .	651	275	97	1,023	884	11	23
	1896-97 . . .	840	300	241	1,381	926	13	10
	1897-98 . . .	134	300	415	849	794	17	9
	1898-99 . . .	721	81	103	905	1,183	40	23
	1899-1900 . . .	751	2,034	651	3,436	1,487	39	210
	1900-01 . . .	375	590	31	996	1,448	28	180
Bilaspur Khalsa	1890-91 . . .	647	46,514	2,599	49,790	3,277	148	6,396
	1891-92 . . .	1,014	18,797	844	20,665	1,492	134	5,231
	1892-93 . . .	603	24,467	710	25,780	1,221	131	5,415
	1893-94 . . .	354	4,020	328	4,702	1,099	157	3,971
	1894-95 . . .	423	2,954	798	4,175	1,665	117	4,385
	1895-96 . . .	781	50,523	1,576	52,880	1,447	115	5,513
	1896-97 . . .	1,848	43,644	30,871	76,363	2,265	221	4,723
	1897-98 . . .	472	1,956	544	2,972	114	111	5,174
	1898-99 . . .	468	3,375	634	4,477	920	109	5,045
	1899-1900 . . .	890	19,390	1,980	22,260	1,010	115	5,060
	1900-01 . . .	253	506	284	1,043	1,122	175	5,660
Bilaspur Zamindaris	1890-91 . . .	...	...	Included in Khalsa.		...	...	...
	1891-92 . . .	...	...			...	...	...
	1892-93 . . .	1	...	...	1	1	...	...
	1893-94 . . .	...	...	1	1	1	...	...
	1894-95 . . .	...	2	1	3	1	...	...
	1895-96 . . .	206	839	311	1,356	424	19	186
	1896-97 . . .	280	2,410	511	3,211	57	16	73
	1897-98 . . .	74	148	72	294	208	...	835
	1898-99 . . .	69	327	103	499	103	6	693
	1899-1900 . . .	90	861	105	1,056	109	6	904
	1900-01 . . .	50	98	150	298	55	32	920

STATEMENT B.—Showing the Progress of Irrigation in each District of the Central Provinces during the years 1890-91 to 1900-01—concl'd.

DISTRICTS.	Year.	IRRIGATION.				NUMBER OF IRRIGATION WELLS.		Number of artificial irrigation tanks.
		AREA IRRIGATED FROM				Temporary.	Durable.	
		Wells.	Tanks.	Other sources.	Total.			
1	2	3	4	5	6	7	8	9
		Acres.	Acres.	Acres.	Acres.			
Sambalpur Khalsa	1890-91 . . .	714	36,342	...	37,056	1,997	34	4,047
	1891-92 . . .	878	34,150	215	35,243	2,635	29	5,480
	1892-93 . . .	1,058	21,880	243	23,181	3,227	37	5,882
	1893-94 . . .	1,742	8,204	479	10,425	3,887	52	5,748
	1894-95 . . .	2,071	6,673	702	9,446	4,320	53	5,757
	1895-96 . . .	2,065	51,499	2,582	56,146	4,172	86	5,512
	1896-97 . . .	2,096	66,342	2,620	71,058	4,514	99	5,566
	1897-98 . . .	1,966	4,832	790	7,588	4,245	100	5,610
	1898-99 . . .	2,173	23,743	1,017	26,933	5,045	109	5,726
	1899-1900 . .	2,813	33,822	1,347	38,012	5,323	107	5,380
1900-01 . . .	968	4,058	427	5,453	4,763	107	5,923	
Sambalpur Zamindaris	1890-91 . . .	...	1,015	...	1,025	64	1	843
	1891-92 . . .	...	...	...	...	...	...	...
	1892-93 . . .	...	...	Included in Khalsa.	...	...	...	...
	1893-94 . . .	...	...		...	...	...
	1894-95 . . .	...	...		...	...	...
	1895-96 . . .	...	26,551	...	26,551	1,812	7	1,114
	1896-97 . . .	506	39,437	270	40,213	3,111	19	2,027
	1897-98 . . .	1,411	8,983	730	11,124	4,286	99	2,593
	1898-99 . . .	1,472	11,168	694	13,334	5,515	143	2,766
	1899-1900 . .	1,983	23,277	1,077	26,337	5,378	238	3,228
1900-01 . . .	1,888	2,152	153	3,698	3,871	244	2,887	
Total Chhattisgarh Division.	1890-91 . . .	8,411	98,961	7,617	114,989	10,614	392	17,334
	1891-92 . . .	5,679	74,012	3,853	83,514	4,184	484	12,656
	1892-93 . . .	6,099	60,233	5,444	71,776	10,508	475	12,809
	1893-94 . . .	6,381	25,831	3,138	35,350	11,330	406	11,852
	1894-95 . . .	8,018	22,936	5,073	36,077	13,627	402	11,605
	1895-96 . . .	7,634	158,451	7,950	174,035	16,050	448	14,087
	1896-97 . . .	12,137	194,553	47,563	254,253	17,197	688	14,779
	1897-98 . . .	10,277	31,812	13,311	62,400	16,354	843	16,857
	1898-99 . . .	12,764	55,498	9,901	78,163	19,763	776	16,811
	1899-1900 . .	9,312	97,379	7,201	113,892	18,413	751	16,244
	1900-01 . . .	5,206	16,646	2,152	24,004	13,844	743	17,010
	GRAND TOTAL	1890-91 . . .	88,894	595,169	24,473	708,536	34,251	7,658	29,683
1891-92 . . .		80,983	535,011	20,275	636,269	29,858	9,668	24,413
1892-93 . . .		93,324	551,295	20,080	669,649	35,050	9,097	25,912
1893-94 . . .		84,183	565,788	12,823	662,789	35,502	11,226	30,041
1894-95 . . .		74,336	536,213	14,236	624,785	38,426	11,686	31,994
1895-96 . . .		73,065	676,544	18,212	767,821	41,763	12,250	34,401
1896-97 . . .		82,603	647,678	60,295	790,576	46,829	12,716	39,084
1897-98 . . .		76,165	462,484	24,086	562,735	43,335	12,656	38,019
1898-99 . . .		77,252	549,974	26,970	654,196	46,564	12,633	41,977
1899-1900 . .		64,188	176,997	14,079	255,264	46,254	13,286	31,838
1900-01 . . .	74,055	311,504	12,466	398,025	41,694	14,004	40,238	



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STATEMENT C.—Showing the Area under each of the principal irrigated Kharif Crops

District.	Year.	RICE, TRANSPLANTED.		RICE, BROAD-CASTED.		SUGARCANE.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Saugor	1890-91	...	4,890	...	16,942	3,900	2,543
	1891-92	161	722	103	20,212	1,260	192
	1892-93	51	762	76	24,686	1,482	435
	1893-94	92	1,227	65	22,947	1,332	332
	1894-95	146	725	54	23,997	1,376	378
	1895-96	122	677	31	26,588	1,723	520
	1896-97	125	693	51	29,347	1,441	432
	1897-98	121	658	23	27,453	1,086	258
	1898-99	119	659	22	27,751	516	115
	1899-1900	69	455	31	25,168	501	106
	1900-01	112	254	19	18,591	331	59
Damoh	1890-91	...	609	...	53,995	123	697
	1891-92	...	42	495	64,057	442	129
	1892-93	58	30	323	71,525	471	52
	1893-94	...	112	304	74,500	452	41
	1894-95	...	110	194	74,132	491	34
	1895-96	84	68	70	68,420	531	55
	1896-97	...	122	93	59,180	397	28
	1897-98	...	112	108	56,899	262	19
	1898-99	...	108	71	62,189	188	7
	1899-1900	...	43	8	62,722	158	5
	1900-01	...	83	...	50,860	146	5
Jubbulpore	1890-91	...	6,113	...	172,494	...	902
	1891-92	...	4,034	...	178,943	1,042	...
	1892-93	...	2,623	...	195,049	851	...
	1893-94	...	5,991	...	176,040	...	1,010
	1894-95	...	4,656	...	216,175	694	630
	1895-96	1	4,487	3	205,570	...	1,791
	1896-97	20	3,717	66	208,294	1,212	...
	1897-98	...	2,718	...	181,118	652	262
	1898-99	...	3,366	...	184,922	403	508
	1899-1900	...	1,009	1	167,800	358	342
	1900-01	...	2,335	...	146,837	379	302
Mandla	1890-91	...	112	...	77,540	...	...
	1891-92	...	120	...	78,501	...	...
	1892-93	...	...	...	79,744	...	...
	1893-94	...	120	...	84,292	...	...
	1894-95	...	126	...	84,412	...	...
	1895-96	...	4,995	...	107,084	321	3
	1896-97	...	367	...	107,290	589	...
	1897-98	...	5,346	...	90,558	606	...
	1898-99	...	2,136	...	119,662	473	...
	1899-00	...	1,626	...	137,786	406	...
	1900-1901	...	1,509	...	104,703	449	...

in each District of the Central Provinces during the years 1890-91 to 1900-01.

GROVES AND ORCHARDS.		MISCELLANEOUS FOODCROPS.		MISCELLANEOUS NON-FOOD-CROPS.		TOTAL KHARIF.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
50	220	...	31,894	...	1,575	4,281	218,126
187	426	336	16,896	1	94,649	2,180	349,779
127	1,693	303	26,035	...	91,786	2,580	347,653
64	1,594	226	15,895	1	87,361	2,072	358,057
55	1,142	231	15,941	...	92,707	2,132	393,449
56	809	190	2,668	...	78,365	2,397	371,284
52	653	186	9,247	...	71,518	2,075	443,347
42	434	157	17,225	...	69,013	1,579	497,435
38	420	146	14,172	...	64,501	967	375,802
30	390	175	13,067	...	62,227	986	390,051
25	581	139	18,726	1	65,600	752	443,159
352	1,956	306	19,939	...	9,211	1,461	209,579
35	1,806	111	29,771	...	68	1,159	209,325
24	215	158	5,553	3	23,432	1,271	205,846
32	516	52	80	...	23,708	1,176	234,894
34	396	80	3,689	...	23,465	1,081	264,607
57	429	230	2,360	...	21,860	1,094	254,267
49	428	59	7,850	...	19,275	894	254,998
36	235	70	9,669	1	20,062	700	254,169
32	165	46	6,496	1	17,369	530	211,864
36	149	20	5,472	...	16,999	389	241,387
29	87	81	7,614	...	16,983	319	269,284
...	10,809	...	8,517	...	19,873	668	505,432
...	2,158	...	46,293	...	16,749	1,042	502,875
...	10,261	...	53,601	...	16,537	851	508,391
...	10,560	...	13,622	...	16,237	...	495,926
34	10,341	59	10,273	...	18,888	833	568,216
...	9,415	...	15,715	...	18,056	265	508,188
...	9,083	...	16,848	...	17,593	1,518	498,196
32	9,080	40	15,663	1	17,866	739	461,734
49	9,167	44	14,176	...	17,414	511	476,659
34	9,062	50	14,162	...	17,366	454	500,321
25	9,476	6	18,449	...	16,750	500	509,627
...	...	...	52,605	...	...	...	358,694
...	...	...	46,419	...	...	...	328,920
...	...	...	72,939	...	...	...	361,175
...	...	...	61,216	...	...	...	378,046
...	...	...	63,273	...	...	...	400,112
47	2	61	17,921	...	...	660	511,951
48	38	9	22,145	...	...	651	394,084
7	5	...	20,609	38	77	635	353,626
4	13	52	20,777	...	...	531	387,634
...	8	1	17,918	...	23	479	416,435
35	229	9	24,933	...	50	403	450,415

STATEMENT C.—Showing the Area under each of the principal irrigated Kharif Crops

District.	Year.	RICE, TRANSPLANTED.		RICE, BROAD-CASTED.		SUGARCANE.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Seoni	1890-91 . . .	21,597	60,582	...	15,948	984	...
	1891-92 . . .	30,640	51,605	...	17,566	1,005	...
	1892-93 . . .	22,687	65,798	...	13,195	788	...
	1893-94 . . .	25,779	63,768	...	14,434	847	...
	1894-95 . . .	25,508	45,608	...	16,729	631	...
	1895-96 . . .	26,015	4,251	...	69,765	1,096	...
	1896-97 . . .	19,480	60,715	...	16,011	...	953
	1897-98 . . .	15,493	25,905	2,523	26,271	838	...
	1898-99 . . .	20,076	33,424	2,527	29,731	640	...
	1899-1900 . . .	777	9,461	822	29,621	517	...
	1900-01 . . .	9,501	18,035	4,107	34,678	435	...
Total Jubbulpore Division	1890-91 . . .	21,597	72,306	...	336,919	5,012	4,342
	1891-92 . . .	30,801	56,523	603	359,279	3,749	1,021
	1892-93 . . .	22,789	69,213	399	384,199	3,592	487
	1893-94 . . .	25,871	71,218	369	372,213	2,631	1,383
	1894-95 . . .	25,664	51,214	248	415,445	3,192	1,042
	1895-96 . . .	26,222	14,478	104	477,427	3,876	2,369
	1896-97 . . .	19,625	65,614	210	420,122	3,639	1,413
	1897-98 . . .	15,614	34,739	2,654	382,699	3,444	539
	1898-99 . . .	20,195	39,693	2,620	424,255	2,220	630
	1899-1900 . . .	846	12,599	862	413,097	1,910	453
	1900-01 . . .	9,613	22,216	4,126	355,669	1,740	366
Narsinghpur	1890-91 . . .	...	176	...	28,617	961	189
	1891-92 . . .	...	233	...	29,259	548	1,235
	1892-93 . . .	...	462	...	32,894	941	540
	1893-94 . . .	...	880	...	25,559	620	399
	1894-95 . . .	...	83	...	36,414	634	427
	1895-96 . . .	...	373	...	56,190	986	633
	1896-97 . . .	...	780	...	68,356	1,046	664
	1897-98 . . .	...	120	1	57,673	923	330
	1898-99 . . .	...	161	...	47,920	414	329
	1899-1900 . . .	...	280	...	47,920	390	330
	1900-01 . . .	...	286	...	53,763	459	315
Hoshangabad	1890-91 . . .	...	115	1	16,101	299	...
	1891-92 . . .	...	1,702	...	16,918	221	413
	1892-93 . . .	...	260	2	18,024	216	338
	1893-94 . . .	...	107	3	19,130	199	313
	1894-95 . . .	...	298	...	19,219	398	237
	1895-96 . . .	...	463	...	25,146	463	172
	1896-97 . . .	...	474	...	22,638	513	82
	1897-98 . . .	...	134	...	25,450	220	47
	1898-99 . . .	...	6	...	23,539	121	69
	1899-1900 . . .	...	25	14	17,758	103	54
	1900-01 . . .	...	109	1	9,663	66	35

in each District of the Central Provinces during the years 1890-91 to 1900-01—*contd.*

GROVES AND ORCHARDS.		MISCELLANEOUS FOODCROPS.		MISCELLANEOUS NON-FOOD-CROPS.		TOTAL KHARIF.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
...	258	...	49,259	...	5,898	22,581	324,979
...	268	...	41,210	...	4,942	31,652	291,571
...	336	...	41,604	...	5,881	23,493	309,176
...	841	19	9,506	15	5,725	26,693	306,962
...	845	22	9,767	...	2,472	26,587	321,379
...	103	22	10,864	...	4,570	27,190	352,856
...	660	174	13,756	...	4,196	19,654	352,265
...	251	26	14,352	...	2,868	18,952	333,164
...	154	23	12,195	...	2,856	23,336	305,093
...	433	26	36,138	...	3,503	2,173	304,736
...	169	27	46,825	1	2,793	14,176	385,315
402	13,243	306	162,214	...	36,557	28,991	1,616,810
222	4,718	447	180,589	1	116,408	36,033	1,682,470
151	12,505	461	199,832	3	137,586	23,195	1,732,241
96	13,011	297	100,819	16	133,031	29,941	1,773,885
123	12,724	392	102,943	...	127,532	30,633	1,947,763
160	10,848	503	49,528	...	122,851	31,606	1,998,546
149	10,865	428	69,846	...	112,582	24,782	1,942,792
117	10,005	293	77,518	40	109,886	22,655	1,900,169
118	9,919	311	67,816	1	102,140	25,875	1,757,052
100	10,042	272	86,757	...	100,118	4,481	1,852,830
114	10,542	262	116,548	2	102,181	16,240	2,057,800
...	2,400	...	10,334	...	33,570	961	251,071
144	2,305	295	33,134	...	7,026	1,095	248,763
66	2,058	...	17,643	...	29,723	1,007	253,839
30	2,041	166	14,176	...	30,102	924	237,582
24	2,906	198	9,608	...	29,866	958	242,156
46	2,931	141	14,877	3	23,625	1,314	264,689
63	2,817	109	17,502	...	27,532	1,298	294,874
26	2,804	119	23,858	...	27,257	1,141	317,844
40	2,871	103	20,108	...	27,079	642	259,010
32	2,673	98	21,239	...	26,428	614	307,765
37	2,556	80	32,470	...	25,839	686	330,151
212	1,913	275	11,467	5	70,779	1,124	338,552
109	297	285	70,086	29	906	1,073	295,456
28	496	218	12,832	21	57,395	821	231,243
38	492	256	6,700	30	54,415	853	258,229
109	2,513	314	10,677	24	57,750	1,163	282,575
233	766	357	5,588	24	56,289	1,326	319,845
89	174	35	6,763	12	45,187	936	258,101
43	66	146	18,775	2	50,745	599	405,439
40	79	107	13,836	...	49,457	427	341,033
37	64	111	14,193	1	44,348	456	314,163
14	3,409	134	23,725	...	46,807	339	349,480

STATEMENT C.—Showing the Area under each of the principal irrigated Kharif Crops

District.	Year.	RICE, TRANSPLANTED.		RICE, BROAD-CASTED.		SUGARCANE.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Nimar	1890-91 . . . . .	...	3	131	11,171	65	...
	1891-92 . . . . .	...	...	13	10,473	35	...
	1892-93 . . . . .	...	...	25	11,726	...	39
	1893-94 . . . . .	...	2	20	17,318	73	1
	1894-95 . . . . .	...	4	24	15,726	105	1
	1895-96 . . . . .	...	5	45	15,753	129	1
	1896-97 . . . . .	...	...	280	19,925	103	...
	1897-98 . . . . .	...	...	4	22,736	101	...
	1898-99 . . . . .	...	...	95	21,270	24	...
	1899-1900 . . . . .	...	...	74	20,457	33	...
	1900-01 . . . . .	...	...	23	9,227	14	...
Betul	1890-91 . . . . .	...	...	...	10,625	7,734	...
	1891-92 . . . . .	...	...	...	10,542	9,272	...
	1892-93 . . . . .	...	...	...	11,745	10,446	...
	1893-94 . . . . .	...	...	...	12,413	6,949	...
	1894-95 . . . . .	...	...	2	13,930	6,712	...
	1895-96 . . . . .	...	...	...	14,449	6,552	...
	1896-97 . . . . .	...	3	15	15,775	6,094	...
	1897-98 . . . . .	...	...	...	14,570	5,193	...
	1898-99 . . . . .	...	...	...	14,804	4,806	...
	1899-1900 . . . . .	...	...	6	15,370	4,656	...
	1900-01 . . . . .	...	...	2	5,119	1,783	...
Chhindwara	1890-91	25	535	1	4,652	4,852	...
	1891-92	23	464	3	7,594	4,020	...
	1892-93 . . . . .	...	502	...	8,649	3,611	...
	1893-94 . . . . .	...	665	...	8,604	3,439	...
	1894-95 . . . . .	...	581	...	6,980	3,543	...
	1895-96	1	507	1	9,653	4,014	...
	1896-97 . . . . .	...	573	10	10,059	3,410	...
	1897-98	1	514	2	9,508	3,461	...
	1898-99	2	586	7	9,199	3,183	...
	1899-1900	8	124	8	9,342	2,936	...
	1900-01 . . . . .	...	196	1	8,218	1,584	...
Total Nerbudda Division	1890-91	25	829	133	71,169	13,911	189
	1891-92	23	2,399	16	74,786	14,096	1,648
	1892-93 . . . . .	...	1,224	27	83,038	15,214	917
	1893-94 . . . . .	...	1,654	23	83,024	11,280	713
	1894-95 . . . . .	...	971	26	92,269	11,392	665
	1895-96	1	1,348	46	121,201	12,149	806
	1896-97 . . . . .	...	1,830	305	136,753	11,171	746
	1897-98	1	768	7	129,937	9,898	377
	1898-99	2	753	102	116,732	8,548	398
	1899-1900	8	430	102	110,851	8,118	384
	1900-01 . . . . .	...	591	27	85,990	3,906	350

in each District of the Central Provinces during the years 1890-91 to 1900-01—contd.

GROVES AND ORCHARDS.		MISCELLANEOUS FOODCROPS.		MISCELLANEOUS NON-FOOD-CROPS.		TOTAL KHARIF.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.]	Unirrigated.
9	10	11	12	13	14	15	16
Acrea.	Acrea.	Acrea.	Acrea.	Acrea.	Acrea.	Acrea.	Acrea.
276	673	489	44,502	81	12,725	1,473	400,363
285	...	1,369	44,400	576	13,858	2,278	446,720
319	486	27	41,607	725	16,096	2,193	452,477
274	472	79	29,002	989	17,952	1,566	453,625
284	502	44	24,270	272	19,923	968	461,440
239	486	1,168	22,771	312	19,737	2,135	463,257
172	228	1,227	27,361	176	9,502	2,259	498,659
218	251	95	30,034	49	6,507	715	535,711
152	193	161	34,174	224	8,830	840	540,623
188	295	105	34,547	142	4,794	734	568,512
163	298	67	57,316	288	7,019	935	596,688
...	333	...	95,210	...	8,639	7,734	352,150
...	460	...	147,145	...	13	9,272	398,014
407	78	...	65,950	...	50,324	10,853	427,725
53	1,870	60	27,449	...	17,090	7,076	381,866
53	219	19	30,990	...	19,583	6,812	402,796
39	190	45	2,483	...	13,323	6,655	400,695
...	...	56,321	33,231	...	6,494	62,542	347,551
24	157	35	38,831	...	5,018	5,346	377,323
10	271	79	31,647	1	6,329	5,062	384,521
24	236	69	31,535	1	4,237	4,862	364,715
29	448	26	43,234	1	5,017	2,094	365,831
...
89	32	8	102,927	...	2,521	5,066	436,108
81	33	6	99,416	...	571	4,146	414,847
31	37	7	105,109	5	2,110	3,674	444,307
32	18	2	12,603	...	1,500	3,490	423,101
99	36	4	29,331	...	1,895	3,683	416,352
118	17	10	30,041	...	1,709	4,163	435,204
104	24	5	94,626	...	1,081	3,542	459,240
60	34	7	36,585	...	1,221	3,567	456,576
57	14	10	33,079	...	1,203	3,290	480,253
24	19	3	39,292	...	690	3,001	485,746
36	25	4	64,941	2	985	1,662	628,273
...
577	5,386	772	264,410	86	123,234	16,353	1,778,269
619	3,095	1,955	398,761	605	27,374	17,564	1,808,800
851	3,155	252	243,151	751	155,648	18,543	1,859,591
427	4,893	563	89,930	969	121,089	13,914	1,754,403
569	6,176	579	104,925	296	129,023	13,589	1,805,319
675	4,390	1,721	75,761	339	120,683	15,595	1,883,691
433	3,243	57,697	179,483	188	89,796	70,578	1,858,425
371	3,312	402	148,083	51	90,743	11,368	2,122,897
299	3,428	460	132,844	225	92,898	10,321	2,005,508
305	3,287	386	143,806	144	80,497	9,667	2,040,901
279	6,736	311	221,686	291	85,667	5,656	2,270,373

STATEMENT C.—Showing the Area under each of the principal irrigated Kharif Crops

DISTRICT.	Year.	RICE, TRANSPLANTED.		RICE, BROADCASTED.		SUGARCANE.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Wardha	1890-91	...	15	1	310	179	...
	1891-92	...	27	5	3,444	212	...
	1892-93	...	27	...	5,550	169	...
	1893-94	...	21	12	7,286	1-0	...
	1894-95	18	...	...	7,427	175	...
	1895-96	8	...	...	9,530	212	...
	1896-97	9	6	36	9,066	116	...
	1897-98	7	41	8	11,910	98	...
	1898-99	7	26	3	10,233	53	...
	1899-1900	...	...	15	6,728	58	...
	1900-01	...	...	3	6,480	37	...
Nagpur	1890-91	18,364	9,504	932	3,445	3,250	...
	1891-92	9,252	18,465	218	5,941	307	...
	1892-93	12,217	14,085	263	4,969	490	...
	1893-94	11,852	14,094	204	5,809	416	...
	1894-95	13,178	16,005	75	5,072	461	...
	1895-96	18,036	16,003	99	6,730	...	544
	1896-97	12,956	16,932	150	6,532	278	...
	1897-98	13,279	14,694	179	9,538	243	...
	1898-99	14,366	15,556	91	8,752	232	...
	1899-1900	312	5,990	54	8,163	302	...
	1900-01	9,184	9,210	1,877	9,216	193	...
Chanda (Khalsa)	1890-91	137,686	25,585	3,666	23,416	3,244	...
	1891-92	137,919	21,707	2,753	21,416	3,244	...
	1892-93	135,277	25,910	5,513	26,688	3,471	...
	1893-94	136,125	27,896	5,690	23,308	3,195	...
	1894-95	128,437	23,723	9,462	36,663	...	3,431
	1895-96	131,970	32,796	4,929	29,624	...	3,291
	1896-97	133,497	32,362	5,067	29,624	2,320	...
	1897-98	125,182	24,964	9,628	31,622	1,856	...
	1898-99	133,167	32,932	7,339	30,588	2,225	...
	1899-1900	17,494	28,457	2,590	43,862	2,189	...
	1900-01	40,741	4,067	25,357	26,140	555	3
Chanda (Zamindari)	1890-91	Included in Khalsa.					
	1891-92						
	1892-93						
	1893-94						
	1894-95	1,559	478	1,554	18,472	...	52
	1895-96	1,559	690	1,606	30,899	...	53
	1896-97	7,643	3,485	6,663	76,462	203	...
	1897-98	8,127	3,617	7,879	92,408	243	...
	1898-99	8,656	3,212	7,406	90,863	210	...
	1899-1900	366	5,864	512	90,012	124	...
	1900-01	872	245	4,901	41,779	47	...

in each District of the Central Provinces during the years 1890-91 to 1900-01—*contd.*

GROVES AND ORCHARDS.		MISCELLANEOUS FOOD-CROPS.		MISCELLANEOUS NON-FOOD-CROPS.		TOTAL KHARIF.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
136	776	252	4,999	2	10,647	698	622,868
327	811	272	3,125	83	10,637	1,109	541,829
129	1,171	324	9,012	40	10,281	960	601,146
249	2,012	438	2,706	1	13,865	1,157	548,896
111	331	627	3,866	1	12,909	1,251	545,518
429	600	245	1,708	3	13,127	1,577	549,824
753	1,731	137	695	10	12,222	1,446	630,977
522	1,967	193	1,800	27	13,142	1,489	713,061
321	612	107	904	3	12,752	1,288	649,876
284	558	129	638	73	6,691	1,359	716,403
216	431	83	1,461	53	8,050	1,628	808,082
3,462	836	2,722	3,636	...	20,254	29,203	582,460
1,726	2,092	1,445	9,921	16	19,038	13,561	575,223
2,708	1,136	398	2,225	15	16,642	18,533	561,338
2,788	1,088	395	3,026	25	17,682	13,406	630,103
3,488	630	539	2,511	39	17,256	20,627	597,660
3,410	627	225	2,664	709	17,084	19,335	642,938
2,980	656	519	2,453	214	16,985	18,702	664,476
2,910	731	286	3,684	68	16,278	19,323	727,800
2,586	794	269	2,372	53	18,188	19,974	672,116
2,558	831	184	2,537	61	13,180	6,035	753,138
2,043	777	261	5,194	92	15,292	16,461	889,100
55	715	876	2,829	14	1,686	145,543	167,214
55	686	890	3,592	...	515	144,863	161,156
104	731	546	3,061	...	5,842	144,983	235,555
292	218	71	5,117	...	5,630	145,836	150,286
...	...	4	4,252	...	6,743	138,403	280,060
60	938	77	4,907	...	7,242	137,440	313,201
...	...	7	4,808	...	5,116	141,770	167,891
55	946	13	5,069	9	7,067	136,880	171,265
48	1,438	10	4,799	...	6,577	143,006	157,362
27	674	8	5,624	3	5,664	22,447	302,304
25	674	35	6,018	...	4,326	66,801	214,127
...	...	...	369	...	7	3,142	35,279
11	291	41	1,147	...	26	3,244	63,670
...	...	...	2,866	1	6	20,036	145,470
9	179	3	3,653	...	32	16,334	171,726
5	238	...	2,096	...	34	16,296	161,858
...	82	3	13,651	5	50	1,011	164,284
4	89	...	5,767	...	45	5,825	92,136

STATEMENT C.—Showing the Area under each of the principal irrigated Kharif Crops

DISTRICT.	Year.	RICE, TRANSPLANTED.		RICE, BROAD-CASTED.		SUGARCANE.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Bhandara (Khalsa)	1890-91 . .	131,521	101,529	12,182	58,677	4,943	...
	1891-92 . .	131,521	101,529	12,182	33,786	4,412	...
	1892-93 . .	131,521	101,529	12,182	38,786	4,412	...
	1893-94 . .	142,455	85,373	15,054	47,334	4,474	...
	1894-95 . .	128,356	93,793	10,583	54,740	...	4,129
	1895-96 . .	127,316	95,900	12,890	52,428	3,995	...
	1896-97 . .	119,256	105,059	14,683	60,142	3,364	...
	1897-98 . .	111,322	78,079	18,353	68,401	3,446	...
	1898-99 . .	127,740	83,421	19,082	56,469	2,953	...
	1899-1900 . .	19,068	73,872	6,122	74,434	3,136	7
	1900-01 . .	64,299	40,195	40,631	84,448	1,070	...
Bhandara (Zamindari)	1890-91 . .	82,414	102,961	6,922	61,855	1,042	...
	1891-92 . .	87,344	107,858	11,819	66,752	1,873	...
	1892-93 . .	82,441	102,961	6,922	61,855	1,042	...
	1893-94 . .	98,412	66,177	12,333	30,191	717	...
	1894-95 . .	85,176	78,901	8,737	31,937	...	753
	1895-96 . .	89,143	75,029	8,548	31,142	671	...
	1896-97 . .	68,133	76,411	7,592	29,601	311	...
	1897-98 . .	47,955	62,567	10,914	47,700	564	...
	1898-99 . .	76,854	65,257	11,962	35,013	572	...
	1899-1900 . .	10,697	83,215	2,702	43,124	486	...
	1900-01 . .	36,005	38,156	22,823	56,762	92	...
Balaghat (Khalsa)	1890-91 . .	59,193	120,580	4,033	20,038	1,795	2
	1891-92 . .	69,301	128,141	3,648	17,558	1,521	6
	1892-93 . .	77,838	153,093	2,563	16,175	1,628	9
	1893-94 . .	79,121	143,808	2,910	26,426	1,204	...
	1894-95 . .	78,262	130,308	1,905	25,922	...	1,495
	1895-96 . .	72,231	118,797	2,864	29,594	879	...
	1896-97 . .	41,488	105,973	4,690	47,436	...	1,088
	1897-98 . .	31,544	43,698	13,718	71,870	862	6
	1898-99 . .	49,420	79,575	8,972	59,095	943	...
	1899-1900 . .	8,254	64,196	2,782	65,694	918	...
	1900-01 . .	20,629	47,988	9,950	82,222	768	...
Balaghat (Zamindari)	1890-91 . .	12,613	38,742	1,107	17,965	436	...
	1891-92 . .	12,896	36,869	2,896	17,643	329	...
	1892-93 . .	14,092	39,176	3,721	16,597	303	39
	1893-94 . .	16,418	51,050	2,983	18,295	362	...
	1894-95 . .	15,765	43,634	2,731	18,597	...	243
	1895-96 . .	16,716	31,865	2,546	19,136	224	...
	1896-97 . .	7,336	28,880	2,087	30,703	...	328
	1897-98 . .	2,110	10,859	2,354	37,423	192	...
	1898-99 . .	5,401	17,094	2,116	27,636	219	...
	1899-1900 . .	2,010	19,771	779	27,160	202	...
	1900-01 . .	1,107	10,237	1,115	35,050	169	...

in each District of the Central Provinces during the years 1890-91 to 1900-01—*contd.*

Groves and Orchards.		Miscellaneous Food-Crops.		Miscellaneous Non-Food-Crops.		Total Kharif	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
57	132	484	23,001	67	11,547	149,357	261,578
57	132	484	6,866	67	11,547	148,826	262,109
57	132	484	6,535	67	11,577	148,826	262,119
132	139	197	8,182	...	6,152	162,890	216,022
150	116	216	2,196	...	6,606	139,385	294,070
128	132	275	2,241	...	6,904	144,794	277,739
159	164	196	1,977	1	6,074	137,888	303,473
136	113	170	7,016	...	4,913	133,561	261,456
148	129	179	1,682	14	5,926	150,639	231,372
180	140	121	2,182	...	4,452	28,936	272,023
148	284	94	8,070	52	4,177	106,777	264,630
63	...	20	6,073	...	45	90,514	184,921
63	...	20	4,963	...	45	101,142	190,534
63	...	20	6,073	...	45	90,511	184,921
10	2	6	10,360	...	406	111,575	135,905
16	8	24	1,156	...	447	94,011	157,377
19	30	7	1,258	...	474	98,408	152,627
13	48	2	1,430	2	531	76,125	144,486
16	42	8	6,373	...	406	59,495	151,664
54	19	9	1,449	...	508	89,485	139,837
9	26	...	1,288	...	330	13,912	158,858
3	95	10	5,420	5	375	59,295	139,510
4	136	68	3,004	...	61	65,102	174,738
16	181	432	5,569	...	2,758	75,047	188,244
37	155	37	23,823	1	2,068	82,174	251,671
40	152	167	10,393	51	2,443	88,651	242,659
24	139	354	3,217	...	1,289	80,545	228,458
25	134	49	9,949	1	2,080	76,889	209,263
31	318	53	12,118	9	1,633	46,376	208,806
25	991	12	10,245	...	1,073	46,228	176,539
17	700	...	11,903	...	1,454	59,406	189,571
2	563	5	10,402	...	1,503	12,019	178,306
13	207	21	11,644	...	1,641	31,432	193,386
2	...	19	2,064	29	95	14,207	80,418
...	32	19	2,944	...	419	16,159	85,342
...	48	3	2,823	...	432	18,131	90,717
...	17	14	4,154	...	611	20,065	119,303
14	16	8	1,362	7	449	18,525	108,088
...	251	82	6,079	10	314	19,629	102,126
...	25	2	4,064	...	399	9,444	87,546
...	112	...	4,236	...	317	4,666	86,814
...	120	...	4,742	...	439	7,749	64,824
...	113	2	4,179	...	446	3,015	66,502
...	114	4	4,149	...	570	2,403	68,987

STATEMENT C.—Showing the Area under each of the principal irrigated Kharif Crops

District.	Year.	RICE, TRANSPLANTED.		RICE, BROAD-CASTED.		SUGARCANE.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Total Nagpur Division .	1890-91 . . .	441,831	398,916	28,843	185,712	14,889	2
	1891-92 . . .	448,233	409,596	33,521	171,540	11,898	6
	1892-93 . . .	453,386	436,791	31,194	170,929	11,515	49
	1893-94 . . .	484,383	368,409	39,186	163,652	10,518	...
	1894-95 . . .	450,751	391,837	35,047	198,830	639	10,103
	1895-96 . . .	451,979	371,289	33,482	209,083	5,981	3,889
	1896-97 . . .	390,318	369,113	40,968	289,566	6,592	1,416
	1897-98 . . .	339,476	238,519	63,033	371,012	7,504	6
	1898-99 . . .	415,611	297,073	56,971	318,654	7,412	...
	1899-1900 . . .	58,001	281,374	15,656	359,182	7,415	7
	1900-01 . . .	173,037	150,101	106,657	342,097	2,931	3
Raipur (Khala) . . .	1890-91 . . .	655	6,353	21,053	1,218,227	1,045	...
	1891-92 . . .	...	27	20,140	1,282,976	1,344	...
	1892-93 . . .	...	11	16,412	1,287,202	1,070	...
	1893-94 . . .	3	990	14,305	1,436,019	1,144	59
	1894-95 . . .	...	1	14,829	1,811,457	1,062	...
	1895-96 . . .	476	20,970	28,465	1,282,796	885	...
	1896-97 . . .	...	...	55,584	1,251,600	514	28
	1897-98 . . .	...	...	34,339	1,154,537	270	3
	1898-99 . . .	10	1,600	26,521	1,232,510	294	...
	1899-1900 . . .	15	1,785	17,466	1,243,598	411	4
	1900-01 . . .	...	...	8,678	1,022,203	244	7
Raipur (Zamindari) . . .	1890-91 . . .	...	703	3	10,529	23	...
	1891-92 . . .	3	1,121	104	31,376	100	...
	1892-93 . . .	27	1,707	284	107,918	101	31
	1893-94 . . .	...	...	...	...	...	Included
	1894-95 . . .	...	754	387	157,790	162	31
	1895-96 . . .	...	484	203	197,963	207	...
	1896-97 . . .	357	51,220	256	228,254	175	47
	1897-98 . . .	9	82	118	231,425	216	37
	1898-99 . . .	9	25,027	59	215,327	301	9
	1899-1900 . . .	478	23,662	1,920	228,166	198	12
	1900-01 . . .	...	3,899	499	151,078	69	28
Bilaspur (Kalsa) . . .	1890-91 . . .	...	1,416	55,711	700,535	964	3,000
	1891-92 . . .	32	166	37,900	832,422	1,246	6,438
	1892-93 . . .	10	57	23,753	797,656	1,585	1,868
	1893-94 . . .	...	19	2,700	831,239	1,391	991
	1894-95 . . .	...	6	2,009	840,052	1,602	1,242
	1895-96 . . .	1	6	49,605	821,079	1,902	1,434
	1896-97 . . .	8	9	73,182	767,850	1,366	1,229
	1897-98 . . .	6	79	1,767	711,005	501	607
	1898-99 . . .	...	69	3,113	763,965	706	745
	1899-1900 . . .	...	6	20,084	752,501	1,284	380
	1900-01 . . .	...	...	2	597,018	386	399

in each District of the Central Provinces during the years 1890-91 to 1900-01—*contd.*

GROVES AND ORCHARDS.		MISCELLANEOUS FOOD-CROPS.		MISCELLANEOUS NON-FOOD-CROPS.		TOTAL KHARIF.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
3,779	2,595	4,441	45,611	112	44,335	494,629	2,074,197
2,244	3,934	3,562	36,980	166	44,959	500,707	2,004,437
3,098	3,373	1,812	53,557	123	46,882	504,123	2,187,517
3,511	3,628	1,288	43,938	77	46,789	542,630	2,043,179
3,803	1,240	1,772	18,929	47	45,706	495,889	2,246,510
4,082	3,003	1,001	29,953	723	47,251	501,316	2,311,383
3,936	2,942	916	30,411	237	42,966	451,847	2,353,065
3,973	5,081	685	42,076	104	43,228	417,976	2,460,325
3,179	4,100	574	29,947	70	45,878	487,843	2,266,316
3,060	2,987	452	40,501	142	32,316	88,734	2,611,824
2,452	2,671	508	47,723	202	34,476	290,622	2,664,008
144	9,545	184	226,426	...	18,850	23,409	1,795,045
25	10,396	130	214,588	...	9,326	21,664	1,784,312
54	8,769	663	167,172	...	7,411	18,256	1,831,499
182	12,259	66	10,134	8	13,180	16,245	2,140,839
167	11,822	94	1,535	...	13,643	16,479	1,861,298
194	12,938	154	202,569	...	14,789	30,598	1,871,534
133	12,604	392	197,793	6	14,092	57,460	1,773,310
134	13,424	159	279,510	5	12,569	35,366	1,835,858
143	12,793	165	194,304	3	13,115	27,671	1,878,500
325	10,683	67	5,263	...	13,574	19,647	1,743,323
80	10,478	34	7,587	...	8,955	9,806	1,767,471
...	249	1	11,005	4	455	50	32,663
20	540	1	909	...	36,541	257	92,679
16	300	115	8,414	...	510	543	215,858
in khalsa.							
13	1,433	...	4,889	...	827	640	287,604
...	1,515	...	19,081	...	918	643	343,664
...	1,778	21	8,789	...	704	889	421,847
6	1,733	8	63,440	...	527	451	377,596
9	1,821	3	62,591	...	967	423	400,215
7	1,445	79	12,572	...	783	2,876	421,716
4	1,103	...	8,473	...	570	572	307,719
157	5,859	195	72,380	62	793	57,008	933,186
6	4,857	51	28,282	...	745	39,305	1,097,160
27	938	66	5,046	...	371	24,507	1,017,580
28	4,824	34	797	...	672	4,210	1,024,508
22	4,849	23	911	...	580	3,709	1,023,462
29	5,047	20	979	...	994	51,687	1,018,753
19	5,215	81	100,007	24	421	74,842	975,424
1	5,700	11	125,799	27	435	2,377	977,332
3	2,764	13	128,088	...	511	4,042	1,050,210
1	4,463	3	5,234	...	369	21,528	997,903
1	4,132	21	10,893	...	286	420	953,722

STATEMENT C.—Showing the Area under each of the principal irrigated Kharif Crops

DISTRICT.	Year.	RICE, TRANSPLANTED.		RICE, BROAD-CASTED.		SUGARCANE.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8
		Acrea.	Acrea.	Acrea.	Acrea.	Acrea.	Acrea.
Bilaspur (Zamindaris)	1890-91						Included in
	1891-92	...	...	...	...	...	...
	1892-93	...	...	...	52,666	...	1,983
	1893-94	...	...	...	52,666	...	2,028
	1894-95	...	...	...	52,666	...	1,983
	1895-96	9	3,372	729	286,696	861	1,431
	1896-97	19	1,627	2,489	286,069	875	1,556
	1897-98	...	14	33	240,957	120	585
	1898-99	...	...	292	252,686	175	415
	1899-1900	...	...	723	255,050	175	512
	1900-01	...	...	30	220,611	98	383
Sambalpur (Khalsa)	1890-91	4,151	13,636	29,067	334,895	2,044	302
	1891-92	4,672	17,446	25,776	450,994	...	3,029
	1892-93	2,903	20,148	14,970	462,530	3,254	...
	1893-94	1,161	21,103	3,516	479,600	3,874	...
	1894-95	1,019	25,051	1,937	463,150	...	4,342
	1895-96	7,823	22,372	42,542	416,679	3,851	...
	1896-97	11,460	22,508	55,265	400,020	1,976	...
	1897-98	578	27,095	2,774	492,357	1,581	...
	1898-99	4,700	26,675	17,132	488,636	2,263	1
	1899-1900	4,848	25,201	23,674	458,957	2,151	4
	1900-01	373	17,301	2,043	432,131	1,756	4
Sambalpur (Zamindaris)	1890-91	38	499	430	109,149	462	...
	1891-92						Included in
	1892-93						Do.
	1893-94						Do.
	1894-95						Do.
	1895-96	278	636	23,356	137,042	1,614	12
	1896-97	837	1,837	34,877	221,147	2,558	12
	1897-98	384	5,147	7,914	331,300	1,329	...
	1898-99	796	7,173	9,552	353,476	1,506	16
	1899-1900	1,888	5,609	20,773	368,977	2,077	14
	1900-01	30	4,318	891	255,174	1,530	17
Total Chhattisgarh Division.	1890-91	4,844	22,607	106,264	2,373,335	4,583	3,302
	1891-92	4,707	18,760	83,920	2,597,768	2,690	9,462
	1892-93	2,940	21,923	54,419	2,707,972	6,010	3,882
	1893-94	1,184	22,112	20,521	2,799,524	6,409	3,069
	1894-95	1,019	25,812	19,162	2,425,115	2,826	7,598
	1895-96	8,587	47,840	144,900	3,092,255	8,820	2,877
	1896-97	12,681	77,201	221,653	3,157,940	6,964	2,872
	1897-98	977	32,417	46,945	3,161,581	4,047	1,232
	1898-99	5,515	60,544	56,669	3,301,500	5,245	1,186
	1899-1900	7,229	56,263	84,640	3,307,249	6,296	926
	1900-01	403	25,518	12,143	2,078,215	4,092	833

in each District of the Central Provinces during the years 1890-91 to 1900-01—*contd.*

Groves and Orchards.		Miscellaneous Food-crops.		Miscellaneous Non-food-crops.		Total Kharif.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Khalsa							
...
...	59	...	7	...	...	...	96,739
...	685	...	13	...	...	...	97,632
...	685	...	13	...	...	...	97,243
8	1,429	8	7,127	...	257	1,167	336,929
22	1,598	5	48,602	...	3,195	2,973	402,862
11	774	2	18,414	...	2,221	166	341,542
...	1,485	2	29,963	...	2	478	341,687
...	1,510	...	17,691	...	7	907	353,882
...	1,503	83	17,924	4	59	231	353,496
8	258	186	23,621	1	74	35,561	460,951
...	404	...	21,806	...	628	30,447	599,890
...	481	184	16,846	...	1,108	21,485	596,006
3	586	157	2,608	...	1,229	8,627	617,868
1	698	188	2,782	...	1,262	3,261	589,417
2	577	257	3,618	2	1,241	54,924	529,277
1	555	288	2,547	2	872	69,399	513,089
6	700	8	11,251	1	1,196	5,215	610,094
12	682	8	16,123	...	1,810	24,389	620,074
11	542	3	15,449	...	1,250	30,953	585,192
10	279	8	9,412	...	870	4,504	526,478
...	...	7	3,446	...	147	937	130,612
Khalsa.							
do.							
do.							
do.							
4	245	43	3,071	...	195	25,314	208,999
6	436	82	5,197	...	208	38,428	335,565
5	473	15	16,926	...	419	9,719	485,805
5	505	3	21,045	...	782	11,934	537,262
3	535	3	18,292	...	1,255	24,827	527,309
1	90	...	12,557	...	378	2,536	381,161
309	15,911	573	336,878	57	20,328	117,165	3,352,457
51	16,197	183	265,585	...	47,240	91,673	3,574,041
97	10,547	1,028	197,485	...	9,400	64,791	3,757,682
213	18,354	257	13,552	8	15,031	29,282	3,880,347
203	19,487	305	10,130	...	16,312	24,089	3,859,019
237	21,751	482	236,445	2	17,994	164,333	4,309,156
181	22,186	869	362,935	32	19,492	243,991	4,422,097
163	22,804	203	515,340	33	17,367	53,294	4,628,227
172	20,050	194	452,115	3	17,187	68,937	4,837,957
347	19,183	155	74,501	...	17,239	100,738	4,634,325
96	17,585	146	66,946	4	11,128	18,069	4,244,047

STATEMENT C.—Showing the Area under each of the principal irrigated Kharif Crops

DISTRICT.	Year.	RICE, TRANSPLANTED.		RICE, BROAD-CASTED.		SUGARCANE.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8
GRAND TOTAL	1890-91 . .	Acres. 468,287	Acres. 494,658	Acres. 135,240	Acres. 2,967,135	Acres. 38,350	Acres. 7,835
	1891-92 . .	483,769	487,278	118,060	3,203,373	32,433	12,137
	1892-93 . .	479,125	529,151	86,039	3,346,129	36,331	5,334
	1893-94 . .	511,438	483,393	60,099	3,418,413	30,868	5,165
	1894-95 . .	477,424	469,834	54,483	3,531,659	18,049	19,408
	1895-96 . .	486,789	434,955	178,532	3,899,966	30,826	9,940
	1896-97 . .	422,624	513,758	263,136	4,004,381	28,366	6,447
	1897-98 . .	356,068	306,443	112,639	4,045,229	24,893	2,154
	1898-99 . .	441,323	398,063	116,362	4,161,141	23,425	2,214
	1899-1900 . .	66,284	350,666	101,160	4,190,379	23,769	1,770
	1900-01 . .	183,053	198,426	122,953	3,461,971	12,669	1,552



in each District of the Central Provinces during the years 1890-91 to 1900-01—*concl'd.*

GROVES AND ORCHARDS.		MISCELLANEOUS FOOD-CROPS.		MISCELLANEOUS NON-FOOD-CROPS.		TOTAL KHARIF.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
5,067	37,135	6,092	809,143	255	229,454	657,143	8,821,733
3,136	27,944	6,146	881,915	772	235,981	646,277	9,064,748
4,197	29,580	3,553	694,025	877	349,516	615,657	9,537,031
4,247	39,886	2,405	247,739	1,070	315,940	615,767	9,451,814
4,698	39,627	3,048	236,928	343	318,573	564,200	9,858,611
5,154	39,992	3,707	391,686	1,064	308,779	712,848	10,502,776
4,699	39,236	59,910	642,675	457	264,836	791,198	10,576,379
4,624	41,002	1,583	783,017	228	261,229	505,293	11,111,618
3,768	37,497	1,539	682,722	299	258,103	592,976	10,866,828
3,812	35,499	1,265	345,565	286	230,170	203,620	11,139,880
2,941	37,534	1,227	452,903	499	233,452	330,587	11,232,228



STATEMENT D.—Showing the Area under each of the principal irrigated Rabi Crops

District.	Year.	WHEAT.		TOBACCO.		GARDEN CROPS.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Raigarh	1890-91	1,882	562,493	6	1,720	675	77
	1891-92	2,775	512,430	1	1,866	654	765
	1892-93	3,257	557,080	9	593	866	1,343
	1893-94	1,403	539,221	10	2,425	1,064	1,112
	1894-95	1,299	319,015	1	2,586	1,032	2,010
	1895-96	1,067	172,313	8	515	1,079	2,931
	1896-97	1,643	96,366	31	241	1,034	2,458
	1897-98	1,965	117,412	26	331	765	2,630
	1898-99	1,900	160,852	5	1,102	902	2,559
	1899-1900	1,965	145,092	30	113	1,005	2,647
	1900-01	3,353	165,864	18	1,212	662	3,045
Dumoh	1890-91 . . . . .	...	235,139	...	1,843	1,007	1,824
	1891-92	70	266,727	...	865	539	505
	1892-93	152	244,726	10	276	489	1,672
	1893-94	53	244,805	13	1,207	787	937
	1894-95	11	145,592	7	1,361	747	1,053
	1895-96	33	68,410	5	258	721	1,025
	1896-97	174	48,849	17	94	489	1,094
	1897-98	222	75,496	23	129	498	975
	1898-99	345	91,624	11	486	608	1,023
	1899-1900	500	90,354	16	144	645	1,033
	1900-01	596	108,005	16	551	458	607
Jubbulpore	1890-91 . . . . .	...	503,925	...	938	...	1,540
	1891-92 . . . . .	...	450,219	...	694	...	799
	1892-93	105	478,319	...	767	...	987
	1893-94	140	367,553	62	1,030	...	2,160
	1894-95	112	328,458	39	995	1,637	607
	1895-96	170	228,917	29	113	...	2,002
	1896-97	351	209,157	63	54	...	1,717
	1897-98	438	284,977	42	129	1,316	391
	1898-99	455	324,613	48	335	1,345	283
	1899-1900	928	190,575	48	56	1,284	362
	1900-01	496	296,408	68	467	1,407	1,182
Mandla	1890-91 . . . . .	...	129,679	...	10	...	...
	1891-92 . . . . .	...	112,752	...	15	...	...
	1892-93 . . . . .	...	140,940	...	197	...	...
	1893-94 . . . . .	...	134,325	...	85	...	...
	1894-95 . . . . .	...	120,353	...	115	...	...
	1895-96	5	42,942	71	305	121	813
	1896-97	17	25,493	108	107	236	340
	1897-98	21	44,126	107	88	199	499
	1898-99	28	61,623	99	299	171	197
	1899-1900	13	44,234	72	116	159	394
	1900-01	25	63,654	119	436	221	165

in each District of the Central Provinces during the years 1890-91 to 1900-01.

MISCELLANEOUS FOOD CROPS.		MISCELLANEOUS NON-FOOD CROPS.		TOTAL RABI.		GRAND TOTAL, KHARIF AND RABI.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
5,375	39,049	286	4,751	8,284	726,171	12,565	944,297
1,484	4,020	1	218	4,967	647,890	7,147	997,769
1,180	2,231	...	359	5,312	661,489	7,892	1,009,142
983	3,359	9	524	3,469	677,073	5,541	1,035,130
1,317	5,805	1	1,422	3,653	637,709	5,785	1,031,058
1,088	830	...	230	3,192	524,359	5,589	895,643
840	1,458	4	290	3,602	307,133	5,677	750,480
891	3,308	2	80	3,675	273,011	5,254	770,496
1,260	2,969	...	69	4,077	335,380	5,044	711,182
962	475	...	727	3,987	297,965	4,973	683,016
1,394	1,251	2	1,425	5,429	290,762	6,181	733,921
...
179	2,997	10	124	1,322	340,183	2,783	549,762
603	13,779	...	64	1,109	336,771	2,268	546,096
470	1,532	...	150	1,159	336,723	2,430	542,569
309	2,004	...	182	1,162	349,019	2,338	583,913
309	2,406	...	127	1,074	316,865	2,155	581,472
284	617	...	111	1,043	236,163	2,137	490,430
352	426	...	90	1,032	175,525	1,916	430,423
340	892	...	499	1,083	188,874	1,783	443,034
371	2,025	...	16	1,336	203,667	1,866	415,531
362	696	...	3	1,523	177,634	1,912	419,021
652	111	...	938	1,722	168,702	2,041	457,936
...
...	13,829	...	577	...	655,613	668	1,161,045
...	19,054	...	63	...	638,004	1,042	1,140,879
1,692	16,873	...	391	1,797	660,766	2,648	1,169,157
...	10,278	...	148	202	712,614	202	1,208,540
254	11,256	2	141	2,044	627,848	2,877	1,196,064
...	8,042	...	117	199	455,795	464	963,983
...	5,899	...	66	414	411,804	1,932	910,002
263	12,217	3	25	2,062	525,907	2,801	987,641
197	11,346	2	45	2,047	561,258	2,558	1,037,917
354	2,076	4	1,473	2,613	377,737	3,072	877,958
315	5,744	6	31,332	2,292	568,420	2,792	1,078,047
...
...	14,516	...	...	...	186,474	...	545,168
...	32,171	...	...	...	217,873	...	546,793
...	7,430	...	...	...	203,565	...	564,740
...	6,206	...	...	...	210,367	...	538,413
...	6,186	...	...	...	199,396	...	509,508
105	915	4	8	324	113,975	984	625,926
19	4,414	...	...	383	78,483	1,034	472,567
66	262	...	14,445	393	155,625	1,078	509,251
94	13,444	...	44	392	146,853	923	534,487
83	198	2	7,065	329	90,482	808	506,917
130	329	...	13,968	495	159,476	988	609,891

STATEMENT D.—Showing the Area under each of the principal irrigated Rabi Crops

District.	Year.	WHEAT.		TOBACCO.		GARDEN CROPS	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Seoni	1890-91 . .	...	265,273	...	1,125	818	...
	1891-92 . .	...	287,809	...	708	69	...
	1892-93 . .	3	329,463	1	732	385	...
	1893-94 . .	...	272,842	10	1,633	296	330
	1894-95 . .	...	209,445	11	1,379	455	476
	1895-96 . .	6	153,477	5	283	112	232
	1896-97 . .	10	125,339	5	201	271	31
	1897-98 . .	...	155,781	...	209	306	311
	1898-99 . .	33	188,661	7	903	269	141
	1899-1900 . .	33	172,560	2	124	180	143
	1900-01 . .	36	174,711	3	839	256	277
Total Jubbulpore Division	1890-91 . .	1,882	1,006,514	6	5,636	2,500	3,441
	1891-92 . .	2,345	1,629,937	1	4,148	1,062	2,069
	1892-93 . .	3,517	1,750,528	20	2,565	1,740	4,002
	1893-94 . .	1,536	1,558,746	95	6,385	2,147	4,539
	1894-95 . .	1,422	1,122,838	53	6,416	3,871	4,146
	1895-96 . .	1,281	666,050	118	1,474	2,073	7,053
	1896-97 . .	2,195	505,204	224	697	2,030	5,670
	1897-98 . .	2,616	677,792	198	886	3,084	4,806
	1898-99 . .	2,851	827,338	170	3,130	3,295	4,208
	1899-1900 . .	3,444	612,815	168	533	3,273	4,534
	1900-01 . .	4,506	808,612	224	3,505	3,004	5,276
Narsinghpur	1890-91 . .	322	251,561	...	1,394	806	770
	1891-92 . .	463	334,783	...	1,272	187	243
	1892-93 . .	225	237,171	...	1,169	914	942
	1893-94 . .	135	245,840	...	1,695	962	1,086
	1894-95 . .	95	159,389	...	1,321	1,226	590
	1895-96 . .	136	131,970	2	473	1,441	350
	1896-97 . .	1,126	91,213	11	223	1,009	257
	1897-98 . .	731	127,079	5	463	1,132	199
	1898-99 . .	710	157,156	2	1,045	843	191
	1899-1900 . .	1,391	124,119	4	264	632	147
	1900-01 . .	1,263	196,241	2	956	813	162
Hoshangabad	1890-91 . .	269	610,015	1	1,707	1,219	2,303
	1891-92 . .	643	617,593	...	2,460	101	3,469
	1892-93 . .	495	635,216	...	2,912	788	9,427
	1893-94 . .	318	669,808	8	2,386	1,213	5,670
	1894-95 . .	170	530,167	...	2,119	983	6,684
	1895-96 . .	326	560,304	2	866	1,662	5,742
	1896-97 . .	1,617	319,502	19	725	668	4,389
	1897-98 . .	1,091	240,536	3	791	605	4,502
	1898-99 . .	1,418	292,825	4	1,002	385	4,853
	1899-1900 . .	2,332	208,718	3	204	456	4,384
	1900-01 . .	2,673	298,854	3	1,023	769	1,150

in each District of the Central Provinces during the years 1890-91 to 1900-01—contd.

MISCELLANEOUS FOOD-CROPS.		MISCELLANEOUS NON-FOOD-CROPS.		TOTAL RABI.		GRAND TOTAL, KHARIF AND RABI.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
...	28,757	...	42	553	400,681	23,434	725,660
415	2,490	...	...	526	399,944	32,173	691,515
470	3,389	...	...	886	427,036	24,379	735,212
115	1,066	...	100	434	428,251	27,127	735,213
175	821	...	10	716	374,159	27,303	695,538
231	676	14	7	426	279,815	27,616	632,671
187	7,863	...	222	473	205,303	20,127	557,573
10	7,386	...	1,384	316	240,123	19,263	573,292
73	9,104	2	225	334	286,380	23,720	591,473
96	400	3	715	319	248,769	2,492	553,505
17	866	...	1,139	312	243,076	14,483	628,391
5,554	99,143	296	5,494	10,459	2,309,122	39,450	3,925,932
2,502	71,514	1	345	6,602	2,240,582	42,635	3,923,052
3,812	31,455	...	900	9,154	2,289,579	37,319	4,021,820
1,407	22,913	9	904	5,267	2,377,324	35,203	4,151,209
2,055	26,474	3	1,700	7,487	2,155,577	38,120	4,103,640
1,658	11,080	18	473	5,184	1,610,107	36,790	3,608,653
1,393	20,060	4	663	5,904	1,178,253	30,636	3,121,045
1,570	21,065	5	16,433	7,529	1,383,545	30,184	3,283,714
1,995	39,333	4	399	8,326	1,533,448	34,201	3,290,500
1,857	3,845	9	9,988	8,776	1,192,587	13,257	3,045,417
2,508	10,301	8	43,802	10,250	1,450,436	26,490	3,508,236
198	14,456	...	415	1,326	401,779	2,287	612,850
821	1,134	...	53	1,470	380,518	2,565	629,281
77	484	...	663	1,216	398,068	2,223	651,997
158	469	...	63	1,255	406,848	2,179	644,430
70	229	2	9	1,393	404,307	2,351	646,463
62	95	...	8	1,641	351,508	2,955	616,197
38	138	...	18	2,184	236,593	3,482	531,467
59	151	1	21	1,978	252,821	3,119	570,665
51	127	...	14	1,636	305,531	2,278	564,541
55	88	1	9	1,993	256,679	2,607	564,444
67	157	13	18	2,098	272,864	2,784	603,015
418	2,614	3	207	1,910	724,734	3,034	1,063,216
1,094	15,089	247	236	2,180	736,154	3,253	1,031,610
857	20,413	13	274	2,153	789,044	2,974	1,070,287
318	1,447	11	203	1,568	801,078	2,726	1,059,807
303	2,056	8	83	1,464	769,606	2,632	1,052,181
131	889	29	125	2,150	693,877	3,476	1,018,223
522	55,681	...	...	2,826	571,288	3,762	829,339
665	99,209	4	34	2,371	462,161	2,970	887,599
564	589	2	59,500	2,373	525,623	2,860	866,706
531	921	1	134,757	3,323	500,090	3,779	814,253
183	1,517	2	45,869	3,635	481,475	3,974	833,905

Statement D.—Showing the Area under each of the principal irrigated Rabi Crops

DISTRICT.	Year.	WHEAT.		TOBACCO.		GARDEN CROPS.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated
1	2	3	4	5	6	7	8
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Nimar	1890-91 . . .	3,250	22,244	...	...	1,944	1,503
	1891-92 . . .	7,622	24,145	12	440	1,615	1,787
	1892-93 . . .	9,313	30,523	2	218	1,422	1,304
	1893-94 . . .	8,044	34,325	7	268	2,359	2,000
	1894-95 . . .	7,022	31,780	7	429	2,233	2,847
	1895-96 . . .	7,046	24,953	10	231	2,038	2,528
	1896-97 . . .	6,014	30,981	1	59	1,486	775
	1897-98 . . .	8,488	15,793	15	183	1,842	1,790
	1898-99 . . .	8,874	23,990	3	398	1,737	1,268
	1899-1900 . .	2,023	158	2	12	1,619	891
	1900-01 . . .	10,630	13,942	20	412	1,025	1,819
Betul	1890-91 . . .	69	166,070	2	307	267	253
	1891-92 . . .	489	152,746	100	189	190	312
	1892-93 . . .	346	159,321	...	591	803	631
	1893-94 . . .	74	176,124	3	711	569	44
	1894-95 . . .	42	172,107	2	1,064	504	35
	1895-96 . . .	695	162,617	4	352	466	51
	1896-97 . . .	3,641	119,517	49	117	411	140
	1897-98 . . .	1,903	117,239	7	279	537	165
	1898-99 . . .	3,525	123,435	6	441	439	25
	1899-1900 . .	1,049	55,231	11	22	418	87
	1900-01 . . .	4,687	73,434	23	334	333	249
Chhindwara	1890-91 . . .	311	204,754	53	1,544	1,402	93
	1891-92 . . .	2,277	170,416	26	981	526	29
	1892-93 . . .	1,955	171,044	21	1,095	1,466	493
	1893-94 . . .	292	150,081	8	971	1,250	22
	1894-95 . . .	362	171,039	4	1,025	1,254	16
	1895-96 . . .	1,996	163,041	10	430	998	261
	1896-97 . . .	2,955	133,643	57	162	1,414	7
	1897-98 . . .	3,329	149,175	46	777	1,329	47
	1898-99 . . .	3,425	164,909	21	1,085	1,197	21
	1899-1900 . .	1,779	81,230	15	59	975	14
	1900-01 . . .	4,270	100,233	61	1,046	1,340	53
Total Nerbudda Division	1890-91 . . .	4,221	1,254,644	56	4,952	5,638	4,922
	1891-92 . . .	11,498	1,199,683	138	5,342	2,709	5,845
	1892-93 . . .	12,334	1,233,275	23	5,985	5,398	12,797
	1893-94 . . .	8,363	1,276,178	26	6,031	6,353	8,772
	1894-95 . . .	7,691	1,064,482	13	5,958	6,200	10,175
	1895-96 . . .	10,199	1,042,885	28	2,352	6,600	8,932
	1896-97 . . .	15,353	724,886	137	1,286	4,988	5,568
	1897-98 . . .	15,595	649,802	76	2,493	5,445	6,703
	1898-99 . . .	17,932	767,315	36	3,971	4,601	6,358
	1899-1900 . .	8,484	470,156	35	561	4,100	5,527
	1900-01 . . .	23,463	622,709	109	3,771	4,230	3,432

in each District of the Central Provinces during the years 1890-91 to 1900-01—*contd.*

MISCELLANEOUS FOOD-CROPS.		MISCELLANEOUS NON-FOOD-CROPS.		TOTAL RABI.		GRAND TOTAL. KHARIF AND RABI.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
161	439	...	8,095	5,355	44,380	6,828	444,743
643	1,185	...	3	9,897	46,247	12,175	492,967
599	1,710	17	2	11,353	56,345	13,546	508,822
87	634	3	135	10,500	64,139	12,066	517,764
87	645	...	109	9,349	59,212	10,317	520,652
85	592	3	101	9,177	50,059	11,312	513,316
202	964	...	...	7,703	54,538	9,962	553,197
359	546	...	30	10,704	33,106	11,419	568,817
331	311	...	34	10,945	49,142	11,785	589,770
137	428	...	...	3,781	3,179	4,515	571,691
51	738	50	77	11,776	35,742	12,711	632,430
40	11,001	100	143	846	314,683	6,580	666,533
292	4,223	31	122	1,102	299,509	10,374	697,523
466	2,466	...	...	1,620	273,863	12,473	701,388
112	391	...	68	758	272,044	7,834	653,910
179	240	...	73	727	267,495	7,539	670,291
163	247	1	75	1,319	242,788	7,974	643,483
300	472	105	135	4,506	171,648	67,049	519,199
177	179	1	86	2,625	161,713	7,971	539,041
277	171	18	167	4,265	190,042	9,327	574,566
121	39	...	79	1,599	85,091	6,461	449,806
123	272	101	1,002	5,240	116,289	7,274	482,120
116	185	1	935	1,863	294,299	6,949	730,402
660	2,193	...	89	3,429	277,900	7,575	692,717
151	12,340	2	12	3,595	272,455	7,269	716,762
150	71	1	400	1,701	284,350	5,191	707,451
61	46	...	281	1,681	297,584	5,364	713,936
124	47	4	277	3,132	257,790	7,295	692,994
52	243	9	454	4,487	199,185	8,029	658,425
67	52	2	397	4,827	212,647	8,394	699,223
39	50	2	203	4,684	243,365	7,974	723,623
126	32	3	181	2,899	118,515	5,900	604,261
184	553	...	884	5,855	159,784	7,517	788,017
1,301	28,695	104	9,795	11,320	1,779,875	27,678	3,553,144
3,455	23,774	278	503	18,078	1,740,323	35,942	3,544,128
2,150	37,413	32	951	19,937	1,789,575	38,485	649,166
825	3,012	15	869	16,082	1,828,459	29,996	3,582,862
700	3,216	10	505	14,614	1,798,204	28,203	3,603,523
555	1,870	37	586	17,419	1,600,522	33,014	3,484,213
1,114	57,503	114	607	21,706	1,233,252	92,284	3,091,677
2,327	100,137	8	568	22,505	1,122,448	33,873	3,245,345
1,262	1,243	23	59,918	23,903	1,313,703	34,224	3,319,206
979	1,508	5	135,026	13,595	963,554	23,252	3,004,455
608	3,237	166	47,850	28,604	1,069,154	34,260	3,339,527

STATEMENT D.—Showing the Area under each of the principal irrigated Rabi Crops

DISTRICT.	Year.	WHEAT.		TOBACCO.		GARDEN CROPS.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Wardha	1890-91	...	192,327	131	2,364	898	838
	1891-92	...	204,252	101	1,565	706	175
	1892-93	176	187,854	90	1,457	560	69
	1893-94	22	195,222	82	1,560	470	176
	1894-95	18	195,426	54	1,592	477	131
	1895-96	339	175,235	75	1,057	543	67
	1896-97	958	115,504	269	177	650	49
	1897-98	629	114,828	190	1,106	405	58
	1898-99	690	126,551	85	1,178	440	81
	1899-1900	390	17,721	123	127	325	7
	1900-01	770	58,987	143	1,120	777	39
	1900-01	770	58,987	143	1,120	777	39
Nagpur	1890-91	...	378,610	...	1,996	1,070	590
	1891-92	1,501	363,182	25	1,714	1,454	1,135
	1892-93	1,273	422,406	33	969	2,748	3,520
	1893-94	155	298,523	31	1,563	2,704	6,696
	1894-95	81	353,297	53	1,223	2,006	5,603
	1895-96	724	336,575	43	671	2,153	5,841
	1896-97	1,608	238,490	140	250	1,731	3,412
	1897-98	2,308	35,437	143	732	1,672	4,474
	1898-99	2,353	273,069	74	744	1,550	5,202
	1899-1900	1,567	152,326	102	134	1,245	3,523
	1900-01	2,813	153,798	198	681	1,409	3,312
	1900-01	2,813	153,798	198	681	1,409	3,312
Chanda (Khalsa)	1890-91	...	95,949	96	539	287	421
	1891-92	30	85,500	96	539	287	23,398
	1892-93	21	78,560	127	713	1,933	6,937
	1893-94	35	86,126	...	789	1,906	6,171
	1894-95	5	73,299	100	943	2,763	5,960
	1895-96	...	61,318	104	552	2,373	5,937
	1896-97	20	43,947	169	342	1,632	3,339
	1897-98	18	49,089	150	485	2,193	4,993
	1898-99	11	49,571	94	405	2,416	2,549
	1899-1900	6	18,629	157	118	1,483	4,716
	1900-01	48	22,208	133	392	2,008	3,920
	1900-01	48	22,208	133	392	2,008	3,920
Jhanda (Zamindaris)	1890-91	Included in Khalsa.					Included
	1891-92	Do.					Do.
	1892-93	Do.					Do.
	1893-94	Do.					Do.
	1894-95	Do.		22	203	113	62
	1895-96	Do.		25	355	112	145
	1896-97	Do.		109	716	537	256
	1897-98	Do.		97	798	569	339
	1898-99	Do.		59	744	671	495
	1899-1900	Do.		36	130	334	144
	1900-01	Do.		39	439	418	344
	1900-01	Do.		39	439	418	344

in each District of the Central Provinces during the years 1890-91 to 1900-01—*contd.*

MISCELLANEOUS FOOD-CROPS.		MISCELLANEOUS NON-FOOD CROPS.		TOTAL RABI.		GRAND TOTAL, KHARIF AND RABI.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
934	579	...	720	1,963	371,425	2,661	994,293
1,088	990	22	748	1,917	389,706	3,026	931,535
1,033	1,500	30	2,530	1,939	352,341	2,899	953,487
759	398	3	223	1,336	330,042	2,493	923,933
595	200	5	286	1,149	356,659	2,400	902,177
273	159	3	528	1,233	322,403	2,510	872,232
345	101	6	162	2,228	223,358	3,671	854,335
366	247	10	151	1,600	212,662	3,089	925,723
245	68	7	63	1,467	257,948	2,755	907,824
209	28	17	8	1,064	65,292	2,423	781,695
109	221	1	50,143	1,800	170,235	3,423	978,317
2,359	57,513	...	2,940	3,894	633,492	33,102	1,220,952
1,969	34,853	4	551	4,953	640,879	18,514	1,216,102
514	24,214	4	225	4,577	700,859	23,110	1,262,470
268	1,193	21	52	3,179	611,340	21,585	1,241,243
201	495	20	147	2,341	612,975	22,968	1,210,635
576	991	35	193	3,536	535,566	22,871	1,173,499
450	16,507	25	80,710	3,954	509,675	22,656	1,174,151
472	27,474	49	53,086	4,639	511,915	23,962	1,239,715
331	18,064	50	33,693	4,388	540,499	24,362	1,212,615
278	33,429	36	94,376	3,223	417,137	9,263	1,170,275
423	34,036	54	99,592	4,992	419,311	21,453	1,302,411
2,391	157,347	...	1,203	2,774	369,381	148,317	536,595
1,123	137,886	...	...	1,541	364,514	146,404	525,670
1,193	60,746	...	20,186	3,324	306,351	148,312	542,406
241	112,931	...	3,761	2,182	375,437	147,568	525,723
754	714	...	...	3,627	221,992	142,030	502,052
747	452	...	...	3,224	173,615	140,664	486,816
866	145,225	1	10,339	2,733	271,732	144,508	439,563
495	120,069	...	67,994	2,856	344,092	139,736	515,357
736	120,302	15	55,453	3,272	343,659	146,278	501,032
815	142,233	8	5,736	2,469	224,629	21,916	526,939
1,465	154,133	8	95,473	3,662	336,162	70,463	550,23
in Khalsa.							
do.							
do.							
do.							
28	7	...	...	163	5,570	3,305	40,849
17	2	...	...	154	8,144	3,398	71,814
131	846	...	301	777	14,251	20,873	159,721
226	1,910	7	310	699	15,674	17,233	187,400
228	832	3	64	961	14,066	17,257	175,924
226	3,609	1	105	597	4,567	1,608	168,851
290	5,315	1	252	748	10,901	6,573	103,027

STATEMENT D.—Showing the Area under each of the principal irrigated Rabi Crops

DISTRICT.	Year.	WHEAT.		TOBACCO.		GARDEN CROPS.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Bhandara (Khalsa)	1890-91 . .	10	147,990	75	131	514	1,066
	1891-92 . .	10	139,052	75	107	441	317
	1892-93 . .	10	162,700	75	107	1,514	2,152
	1893-94 . .	1	129,357	37	152	1,911	3,687
	1894-95 . .	5	123,799	33	168	1,996	3,787
	1895-96 . .	2	107,345	17	92	2,008	3,958
	1896-97 . .	239	70,108	61	70	1,522	2,063
	1897-98 . .	82	86,207	32	89	1,194	2,392
	1898-99 . .	46	95,989	36	124	1,409	2,704
	1899-1900 . .	35	53,948	16	15	1,230	2,431
	1900-01 . .	109	66,030	40	141	1,267	2,315
Bhandara (Zamindaris)	1890-91 . .	Included in Khalsa.		8	31	465	123
	1891-92 . .	Do.		8	31	82	...
	1892-93 . .	Do.		8	31	465	123
	1893-94 . .	Do.		24	177	658	472
	1894-95 . .	Do.		3	126	664	341
	1895-96 . .	Do.		8	121	728	550
	1896-97 . .	Do.		17	83	281	311
	1897-98 . .	Do.		4	83	471	231
	1898-99 . .	Do.		10	71	436	247
	1899-1900 . .	Do.		13	24	384	211
	1900-01 . .	Do.		11	38	569	210
Balaghat (Khalsa)	1890-91 . .	11	28,477	525	265	231	282
	1891-92 . .	2	30,999	546	1,038	287	242
	1892-93 . .	9	32,491	574	292	419	339
	1893-94 . .	10	30,437	426	356	384	1,400
	1894-95 . .	...	23,941	586	365	...	320
	1895-96 . .	12	22,021	559	264	395	291
	1896-97 . .	5	10,703	370	158	348	197
	1897-98 . .	6	18,059	369	202	283	182
	1898-99 . .	22	19,903	402	183	313	384
	1899-1900 . .	46	4,773	398	84	324	136
	1900-01 . .	27	14,052	451	195	145	180
Balaghat (Zamindaris)	1890-91 . .	Included in Khalsa.		307	144	73	126
	1891-92 . .	Do.		419	40	71	42
	1892-93 . .	Do.		336	59	85	208
	1893-94 . .	Do.		508	43	144	331
	1894-95 . .	Do.		571	50	...	188
	1895-96 . .	Do.		546	69	165	124
	1896-97 . .	Do.		335	35	113	73
	1897-98 . .	Do.		149	136	126	210
	1898-99 . .	Do.		350	39	64	107
	1899-1900 . .	Do.		269	13	97	93
	1900-01 . .	Do.		375	29	77	37

in each District of the Central Provinces during the years 1890-91 to 1900-01—*contd.*

MISCELLANEOUS FOOD-CROPS.		MISCELLANEOUS NON-FOOD-CROPS.		TOTAL RABI.		GRAND TOTAL. Kharif and Rabi.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
384	20,692	1	665	1,087	314,143	150,744	575,721
1,457	13,356	1	579	2,087	282,921	150,913	545,030
384	11,131	1	579	2,087	306,579	150,913	568,698
145	56,819	51	1,266	2,145	383,357	164,535	599,350
174	627	...	904	2,208	305,480	141,598	599,550
218	663	4	349	2,249	228,156	147,043	505,895
217	17,279	...	200	2,069	179,299	139,957	482,772
468	53,068	31	251	1,807	268,737	135,868	530,193
968	52,393	2	1,425	1,865	307,313	152,500	538,685
368	48,789	...	1,129	1,649	175,168	30,585	447,191
162	77,322	1	5,087	1,599	264,476	108,376	529,156
323	1,300	...	78	117	49,239	90,631	234,160
706	2,238	...	78	817	50,274	101,959	240,808
323	1,303	...	78	817	49,242	91,328	234,163
186	7,926	...	422	868	100,612	112,443	236,517
143	199	...	29	810	88,805	94,821	246,182
174	223	1	19	911	69,327	99,319	221,954
47	864	...	95	345	26,527	76,470	171,013
122	4,420	3	200	600	62,164	60,095	213,828
312	6,681	...	56	758	70,457	90,243	210,294
267	5,002	...	213	664	17,015	14,576	175,873
8	9,784	...	104	588	65,503	59,883	205,013
223	1,985	7	155	1,004	82,384	66,106	257,122
402	3,232	4	537	1,241	108,668	76,288	291,912
307	2,065	1	268	1,310	114,273	83,484	265,944
453	2,221	97	167	1,370	130,141	85,021	372,800
637	1,357	2	1,428	1,275	111,647	81,820	340,102
117	2,346	3	188	1,086	90,906	77,975	300,169
104	1,192	4	1,402	831	36,315	47,207	245,118
...	5,245	...	2,693	658	80,020	46,886	255,553
2	23,932	...	2,778	739	115,890	60,145	305,439
23	9,111	...	1,395	786	28,572	12,805	206,878
162	29,769	6	2,277	791	95,885	32,223	289,244
69	609	...	69	451	23,432	14,658	103,850
88	681	...	64	578	29,506	16,737	114,848
12	236	10	48	498	28,679	18,624	119,396
103	604	5	116	760	30,052	20,825	149,355
338	405	6	83	915	31,673	19,410	139,721
28	811	...	8	739	30,963	20,368	133,069
23	1,363	...	576	471	10,544	9,915	98,090
...	934	...	785	275	22,612	4,941	109,426
2	13,760	...	825	416	33,859	8,165	100,188
5	2,394	...	389	371	10,342	3,386	76,850
17	16,853	...	838	469	33,030	2,872	102,017

STATEMENT D.—Showing the Area under each of the principal irrigated Rabi Crops

DISTRICT.	Year.	WHEAT.		TOBACCO.		GARDEN CROPS.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Total Nagpur Division	1890-91 . .	21	843,253	1,142	5,470	3,538	3,386
	1891-92 . .	1,543	822,985	1,270	5,304	3,328	24,309
	1892-93 . .	1,494	884,011	1,293	3,633	7,774	13,408
	1893-94 . .	223	739,670	1,108	4,645	8,177	18,933
	1894-95 . .	109	769,762	1,402	4,670	8,024	16,342
	1895-96 . .	1,077	702,494	1,377	3,181	8,482	16,913
	1896-97 . .	2,830	479,052	1,470	1,831	6,864	9,699
	1897-98 . .	3,038	305,674	1,134	3,651	6,913	12,904
	1898-99 . .	3,122	565,083	1,110	3,488	7,329	11,769
	1899-1900 . .	3,044	247,397	1,109	650	5,422	11,261
	1900-01 . .	3,767	320,075	1,390	3,035	6,760	10,357
Raipur (Khalsa)	1890-91 . .	22	199,382	190	2,431	2,892	5,978
	1891-92 . .	50	167,937	1,204	1,297	1,955	3,290
	1892-93 . .	23	223,030	207	2,574	81	910
	1893-94 . .	17	203,535	229	2,560	1,752	5,872
	1894-95 . .	...	201,570	207	1,948	4,006	4,443
	1895-96 . .	49	173,809	157	1,320	4,374	4,430
	1896-97 . .	90	129,368	209	1,045	2,945	3,452
	1897-98 . .	27	159,341	197	1,262	3,210	5,628
	1898-99 . .	16	177,851	193	1,209	3,543	4,039
	1899-1900 . .	1	137,684	210	605	2,299	2,225
	1900-01 . .	17	159,608	150	1,175	2,315	3,654
Raipur (Zamindari)	1890-91 . .	Included in Khalsa.		2	176	9	147
	1891-92 . .	do.		...	372	2	128
	1892-93 . .	do.		71	672	2	250
	1893-94 . .	do.					Included
	1894-95 . .	do.		107	855	234	835
	1895-96 . .	do.		137	803	232	827
	1896-97 . .	do.		158	893	294	715
	1897-98 . .	do.		122	860	255	955
	1898-99 . .	do.		188	927	217	544
	1899-1900 . .	do.		143	450	334	579
	1900-01 . .	do.		108	914	302	699
Bilaspur (Khalsa)	1890-91 . .	894	111,235	82	798	537	2,971
	1891-92 . .	237	118,754	12	801	143	1,610
	1892-93 . .	99	158,378	38	1,009	32	927
	1893-94 . .	12	139,247	41	647	336	2,164
	1894-95 . .	...	140,555	64	838	286	1,389
	1895-96 . .	95	115,786	92	418	441	2,087
	1896-97 . .	603	72,512	101	407	552	1,633
	1897-98 . .	50	128,339	54	490	474	1,702
	1898-99 . .	21	143,680	25	345	308	1,545
	1899-1900 . .	216	120,880	32	256	405	1,749
	1900-01 . .	...	112,944	19	669	502	2,675

in each District of the Central Provinces during the years 1890-91 to 1900-01—*contd.*

MISCELLANEOUS FOOD-CROPS.		MISCELLANEOUS NON-FOOD-CROPS.		TOTAL RABI.		GRAND TOTAL, KHARIF AND RABI.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
6,683	240,025	8	5,835	11,990	1,848,496	506,619	3,922,693
6,833	193,236	31	2,557	13,134	2,860,005	513,841	3,864,442
3,816	101,595	46	23,914	14,547	1,859,047	518,670	4,046,564
2,155	182,097	177	6,037	11,840	2,010,782	554,470	4,053,961
2,920	4,504	33	2,877	12,488	1,734,994	508,377	3,981,404
2,150	6,147	46	1,285	13,132	1,460,736	514,448	3,772,119
2,213	183,377	36	93,835	13,413	1,274,966	465,260	3,628,031
2,149	222,417	100	125,470	13,334	1,291,725	431,310	3,752,050
2,224	234,988	77	94,371	13,862	1,688,980	501,705	3,955,296
2,191	244,595	62	103,346	10,828	242,694	99,562	3,554,518
2,661	327,486	71	253,716	14,649	1,395,958	305,271	4,059,966
410	15,756	6	4,644	3,460	830,420	26,869	2,625,465
2,512	90,105	1	867	5,722	959,147	27,386	2,743,459
3,260	19,293	2	1,134	3,643	976,853	21,904	2,808,357
2,163	3,737	32	1,718	4,331	1,032,567	20,626	3,172,906
567	2,345	1	1,685	4,781	917,097	21,260	2,778,390
729	1,945	4	928	5,313	510,226	35,911	2,331,760
823	2,202	12	4,442	4,079	390,937	61,539	1,164,247
614	1,999	156	4,736	4,204	477,767	39,570	2,313,625
544	2,896	...	3,723	4,296	544,299	31,967	2,422,808
619	1,925	2	939	3,131	312,099	22,773	2,060,422
211	2,244	...	4,118	2,693	382,425	12,499	2,089,896
20	535	...	88	31	5,732	81	38,395
18	11,211	3	82	23	29,497	280	132,176
229	3,147	...	5	302	43,255	845	239,113
in Khalsa.							
20	307	...	88	391	52,925	1,031	340,529
...	571	...	56	369	50,641	1,012	394,305
14	91	8	1,314	474	32,034	1,363	453,881
19	196	1	1,025	397	25,200	848	402,796
75	626	...	1,068	480	33,180	903	433,395
80	415	...	11	557	14,764	3,433	436,480
11	205	3	1,285	424	28,093	996	335,812
240	57,393	203	12,131	3,035	486,767	60,043	1,419,953
96	19,159	2	162	490	599,422	37,795	1,696,582
82	2,051	1	440	263	599,461	24,770	1,617,041
86	1,336	1	419	476	678,949	4,686	1,713,457
106	1,621	...	251	456	618,526	4,165	1,626,988
174	912	...	4	802	233,980	52,489	1,252,733
98	1,018	9	3,530	1,363	153,294	76,205	1,128,718
50	1,453	2	14,198	630	308,412	3,007	1,280,744
49	1,742	...	15,376	403	355,139	4,445	1,415,349
53	1,293	...	33	706	200,058	26,234	1,197,961
102	2,496	...	80	623	310,572	1,043	1,274,294

STATEMENT D.—Showing the Area under each of the principal irrigated Rabi Crops

DISTRICT.	Year.	WHEAT.		TOBACCO.		GARDEN CROPS.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
	1890-91 . . .	Included in Khalsa.					Included
	1891-92 . . .	Do.					Do.
	1892-93 . . .	Do.		...	100	...	590
	1893-94 . . .	Do.		...	100	...	79
	1894-95 . . .	Do.		...	100	...	...
Bilaspur (Zamindaris)	1895-96 . . .	Do.		67	785	33	2,216
	1896-97 . . .	Do.		89	642	63	495
	1897-98 . . .	Do.		52	596	19	389
	1898-99 . . .	Do.		12	612	9	458
	1899-1900 . . .	Do.		5	391	86	377
	1900-01 . . .	Do.		46	626	20	337
	1890-91 . . .	24	1,881	26	126	647	274
	1891-92 . . .	18	1,768	84	248	...	748
	1892-93 . . .	25	2,335	186	285	805	260
	1893-94 . . .	23	1,445	160	153	823	161
	1894-95 . . .	23	959	184	222	1,022	152
Sambalpur (Khalsa)	1895-96 . . .	35	643	158	149	589	336
	1896-97 . . .	41	708	212	150	673	246
	1897-98 . . .	34	964	205	153	2,035	789
	1898-99 . . .	64	1,393	210	149	2,151	666
	1899-1900 . . .	186	521	207	77	2,129	508
	1900-01 . . .	108	1,486	85	161	798	571
	1890-91 . . .	Included in Khalsa.		14	201	45	41
	1891-92 . . .	Do.					Included
	1892-93 . . .	Do.					Do.
	1893-94 . . .	Do.					Do.
	1894-95 . . .	Do.					Do.
Sambalpur (Zamindaris)	1895-96 . . .	Do.		104	173	344	277
	1896-97 . . .	Do.		182	146	498	405
	1897-98 . . .	Do.		230	215	1,083	694
	1898-99 . . .	Do.		241	235	1,094	643
	1899-1900 . . .	Do.		254	109	1,110	383
	1900-01 . . .	Do.		219	161	796	384
	1890-91 . . .	940	312,498	314	3,732	4,070	9,411
	1891-92 . . .	305	288,459	1,300	2,718	2,100	5,776
	1892-93 . . .	152	383,743	502	4,640	920	2,987
	1893-94 . . .	52	349,227	430	3,460	2,911	8,276
	1894-95 . . .	23	343,054	562	3,963	5,578	6,819
Total Chhattisgarh Division	1895-96 . . .	179	290,238	715	3,648	6,013	10,173
	1896-97 . . .	734	202,588	951	3,383	5,025	6,947
	1897-98 . . .	111	288,644	860	3,576	7,076	10,158
	1898-99 . . .	101	322,824	865	3,527	7,322	7,895
	1899-1900 . . .	403	259,035	851	1,890	6,363	5,821
	1900-01 . . .	125	274,038	627	3,706	4,733	8,920

in each District of the Central Provinces during the years 1890-91 to 1900-01—contd.

MISCELLANEOUS FOOD-CROPS.		MISCELLANEOUS NON-FOOD CROPS.		TOTAL RABI.		GRAND TOTAL. KHARIF, AND RABI.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
in Khalsa.							
Do.							
2	50	...	...	2	43,196	2	125,829
2	50	...	...	2	42,350	2	139,082
2	44	...	...	2	42,805	2	140,048
5	1,268	...	80	105	79,197	1,272	416,126
10	1,445	...	4,135	162	17,974	3,135	420,836
1	1,317	...	7,111	72	25,861	238	367,403
...	3,680	...	9,291	21	40,799	499	382,486
2	857	...	2	98	10,531	1,000	364,463
...	965	...	...	66	24,297	297	377,793
206	1,073	1	18	906	4,755	36,467	465,706
...	3,977	...	27	102	13,403	30,549	613,293
528	3,789	9	28	1,553	13,554	23,038	609,560
496	1,076	...	118	1,502	11,342	10,329	629,210
530	609	...	181	1,759	8,731	5,020	598,148
355	1,161	...	11	1,137	4,223	56,061	533,500
586	402	...	590	1,512	3,839	70,911	51,923
43	63	1	1,935	2,318	6,366	7,533	616,460
5	328	11	2,942	2,441	9,472	26,830	629,546
2	111	12	386	2,536	3,284	33,489	583,476
7	7	7	1,443	1,005	5,794	5,509	532,272
19	3,068	...	11	79	8,256	1,016	138,865
in Khalsa.							
Do.							
Do.							
Do.							
123	287	...	6	571	3,653	25,885	212,652
223	371	43	835	956	4,982	39,384	340,547
25	104	10	1,320	1,348	5,129	11,067	490,934
1	6	11	2,144	1,347	8,878	13,231	546,140
3	8	41	961	1,408	1,351	26,235	528,660
8	9	50	822	1,073	2,631	3,609	383,842
895	77,825	210	16,892	7,511	1,335,930	124,676	4,688,387
2,626	124,452	6	1,138	6,337	1,601,469	98,010	5,175,510
4,101	28,330	23	1,616	5,768	1,676,324	70,559	5,434,006
2,747	6,199	33	2,317	6,361	1,765,208	85,643	5,645,555
1,225	4,926	1	2,205	7,389	1,623,084	31,478	5,482,108
1,386	6,144	4	1,085	8,297	1,142,245	172,630	5,451,401
1,759	5,529	77	14,846	8,546	603,060	252,537	5,025,157
752	5,132	170	30,825	8,969	843,735	62,263	5,471,962
674	9,278	22	34,544	8,988	991,767	77,925	5,829,724
759	4,609	55	1,732	8,431	443,501	109,169	5,077,826
339	5,926	60	7,753	5,884	753,862	23,953	4,997,909

STATEMENT D.—Showing the Area under each of the principal irrigated Rabi Crops

District.	Year.	WHEAT.		TOBACCO.		GARDEN CROPS.	
		Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated	Unirrigated.
1	2	3	4	5	6	7	
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres
	1890-91 . . .	7,064	4,106,909	1,518	19,790	15,746	21,160
	1891-92 . . .	16,191	3,941,069	2,709	17,512	9,199	37,999
	1892-93 . . .	17,497	4,251,557	1,838	16,823	15,832	33,144
	1893-94 . . .	10,784	3,923,821	1,659	20,521	19,583	40,520
	1894-95 . . .	9,245	3,300,226	2,035	21,007	23,673	37,482
GRAND TOTAL . . .	1895-96 . . .	12,736	2,701,676	2,238	10,655	23,168	43,071
	1896-97 . . .	21,112	1,911,730	2,782	7,197	18,957	27,884
	1897-98 . . .	21,390	2,151,349	2,263	10,586	22,518	34,571
	1898-99 . . .	24,056	2,522,600	2,185	14,116	22,547	30,230
	1899-1900 . . .	14,375	1,619,402	2,163	3,654	19,158	27,193
	1900-01 . . .	31,866	2,025,464	2,350	14,017	18,777	27,385



in each District of the Central Provinces during the years 1890-91 to 1900-01—*conold.*

MISCELLANEOUS FOOD-CROPS.		MISCELLANEOUS NON-FOOD-CROPS.		TOTAL RABI.		GRAND TOTAL, KHARIF AND RABI.	
Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
9	10	11	12	13	14	15	16
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
14,433	445,693	618	38,016	41,280	7,319,487	698,423	16,141,220
15,421	412,976	316	4,543	44,151	7,383,088	690,428	16,447,836
13,879	198,793	101	27,381	49,406	7,582,261	665,063	17,119,292
7,134	214,221	234	10,127	39,550	7,807,654	655,317	17,258,468
6,900	39,120	47	7,287	41,978	7,082,142	606,178	16,940,753
5,749	25,241	105	3,429	44,032	5,427,631	756,880	15,930,407
6,484	266,469	231	109,956	49,569	4,148,556	840,767	14,724,985
5,798	351,751	283	172,796	52,337	4,736,439	557,630	15,848,057
6,155	284,902	125	189,232	55,079	5,402,565	648,055	16,269,393
5,777	254,557	131	250,092	41,630	3,411,346	253,250	14,551,226
6,116	346,952	305	358,121	59,387	4,548,012	389,974	15,770,240

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STATEMENT E.—Showing the amount of Loans made under the Land Improvement Loans Act (XIX of 1883) in each District of the Central Provinces during 1890-91 to 1900-01.

District.	Year.	Amount advanced.	Amount of principal recovered.	District.	Year.	Amount advanced.	Amount of principal recovered.
1	2	3	4	1	2	3	4
		R a. p.	R a. p.			R a. p.	R a. p.
Saugor . . .	1890-91 . .	9,993 0 0	210 0 0	Seoni . . .	1890-91 . .	3,325 0 0	740 0 0
	1891-92 . .	4,224 8 0	2,379 8 0		1891-92 . .	1,200 0 0	1,312 0 0
	1892-93 . .	2,052 0 0	3,412 0 0		1892-93 . .	1,150 0 0	1,696 0 0
	1893-94 . .	3,414 8 0	3,324 0 0		1893-94 . .	1,223 0 0	1,874 12 0
	1894-95 . .	...	814 12 0		1894-95 . .	1,350 0 0	1,472 4 0
	1895-96 . .	...	5,951 2 8		1895-96 . .	...	1,193 10 8
	1896-97 . .	550 0 0	625 10 0		1896-97 . .	9,250 0 0	945 7 5
	1897-98 . .	175 0 0	761 10 0		1897-98 . .	1,550 0 0	616 15 0
	1898-99 . .	8,670 0 0	854 0 0		1898-99 . .	5,095 0 0	4,296 0 0
	1899-1900 . .	2,950 0 0	768 0 0		1899-1900 . .	6,226 0 0	4,198 0 0
	1900-01 . .	3,785 0 0	127 0 0		1900-01 . .	225 0 0	2,197 0 0
Damoh . . .	1890-91 . .	250 0 0	40 0 0	Total Jubbulpore Division.	1890-91 . .	14,893 0 0	1,829 2 8
	1891-92 . .	60 0 0	124 0 0		1891-92 . .	7,179 8 0	4,968 10 8
	1892-93 . .	100 0 0	143 0 0		1892-93 . .	5,062 0 0	6,412 7 8
	1893-94 . .	625 0 0	177 0 0		1893-94 . .	12,381 10 0	6,614 7 0
	1894-95 . .	100 0 0	...		1894-95 . .	4,340 0 0	3,794 0 0
	1895-96 . .	...	155 0 0		1895-96 . .	...	7,945 0 5
	1896-97 . .	...	50 0 0		1896-97 . .	11,975 0 0	1,714 1 6
	1897-98 . .	57,525 0 0	3,795 0 0		1897-98 . .	59,250 0 0	7,242 14 11
	1898-99 . .	1,100 0 0	17,825 0 0		1898-99 . .	15,165 0 0	26,240 0 0
	1899-1900 . .	13,767 0 0	62 0 0		1899-1900 . .	23,773 0 0	5,318 0 0
	1900-01 . .	960 0 0	1,536 0 0		1900-01 . .	14,315 0 0	5,008 0 0
Jubbulpore . .	1890-91 . .	1,325 0 0	839 2 8	Narsinghpur . .	1890-91 . .	...	60 0 0
	1891-92 . .	1,695 0 0	1,123 2 8		1891-92 . .	...	...
	1892-93 . .	1,760 0 0	1,161 7 8		1892-93 . .	36 0 0	...
	1893-94 . .	7,617 2 0	1,233 11 0		1893-94 . .	900 0 0	...
	1894-95 . .	2,890 0 0	1,507 0 0		1894-95 . .	1,480 0 0	326 12 0
	1895-96 . .	...	645 3 1		1895-96 . .	...	618 6 8
	1896-97 . .	2,175 0 0	93 0 0		1896-97 . .	2,600 0 0	375 3 3
	1897-98 . .	...	2,069 5 11		1897-98 . .	...	1,520 13 4
	1898-99 . .	...	3,265 0 0		1898-99 . .	...	1,735 0 0
	1899-1900 . .	280 0 0	285 0 0		1899-1900 . .	2,365 0 0	240 0 0
	1900-01 . .	8,345 0 0	1,048 0 0		1900-01 . .	965 0 0	492 0 0
Mandla . . .	1890-91 . .	...	...	Hoshangabad . .	1890-91 . .	...	...
	1891-92 . .	...	...		1891-92 . .	...	...
	1892-93 . .	...	...		1892-93 . .	2,800 0 0	50 0 0
	1893-94 . .	...	...		1893-94 . .	100 0 0	370 0 0
	1894-95 . .	...	...		1894-95 . .	750 0 0	1,075 0 0
	1895-96 . .	...	...		1895-96 . .	...	1,952 0 0
	1896-97 . .	...	...		1896-97 . .	5,545 0 0	437 0 0
	1897-98 . .	...	...		1897-98 . .	14,374 8 0	747 8 0
	1898-99 . .	300 0	...		1898-99 . .	...	3,376 0 0
	1899-1900 . .	600 0	...		1899-1900 . .	100 0 0	1,679 0 0
	1900-01 . .	1,000 0 0	100 0 0		1900-01 . .	...	1,072 0 0

STATEMENT E.—Showing the amount of Loans made under the Land Improvement Loans Act (XIX of 1883) in each District of the Central Provinces during 1890-91 to 1900-01—contd.

District.	Year.	Amount advanced.	Amount of principal recovered.	District.	Year.	Amount advanced.	Amount of principal recovered.
1	2	3	4	1	2	3	4
		R a. p.	R a. p.			R a. p.	R a. p.
Nimar	1890-91	2,000 0 0	1,852 10 3	Wardha	1890-91	...	...
	1891-92	25 0 0	2,523 2 3		1891-92	...	...
	1892-93	1,050 0 0	1,692 2 8		1892-93	300 0 0	...
	1893-94	477 0 0	1,279 10 3		1893-94	266 0 0	100 0 0
	1894-95	930 0 0	1,610 2 4		1894-95	1,750 0 0	225 0 0
	1895-96	770 0 0	1,211 2 4		1895-96	...	302 0 0
	1896-97	2,950 0 0	1,093 2 4		1896-97	...	378 0 0
	1897-98	...	905 0 0		1897-98	...	200 0 0
	1898-99	300 0 0	803 0 0		1898-99	50 0 0	394 0 0
	1899-1900	5,099 0 0	872 0 0		1899-1900	15,326 0 0	136 0 0
	1900-01	5,696 0 0	1,926 0 0		1900-01	6,791 0 0	723 0 0
Betul	1890-91	1,440 0 0	523 0 0	Nagpur	1890-91	...	1,298 8 0
	1891-92	1,085 0 0	559 0 0		1891-92	1,650 0 0	1,192 8 0
	1892-93	1,460 0 0	885 0 0		1892-93	4,700 0 0	1,517 8 0
	1893-94	1,300 0 0	1,721 0 0		1893-94	2,417 0 0	2,367 8 0
	1894-95	410 0 0	1,071 0 0		1894-95	3,151 0 0	1,534 0 0
	1895-96	100 0 0	1,056 0 0		1895-96	710 0 0	1,976 0 0
	1896-97	1,762 0 0	890 0 0		1896-97	43,156 0 0	1,633 9 0
	1897-98	16,623 8 0	1,356 14 9		1897-98	...	6,370 3 0
	1898-99	378 0 0	5,068 0 0		1898-99	1,296 0 0	8,023 0 0
	1899-1900	2,480 0 0	2,403 0 0		1899-1900	12,415 0 0	6,112 0 0
	1900-01	...	107 0 0		1900-01	10,115 0 0	7,768 0 0
Chhindwara	1890-91	...	...	Chanda	1890-91	200 0 0	1,322 0 4
	1891-92	720 0 0	25 0 0		1891-92	1,200 0 0	1,350 13 4
	1892-93	1,814 0 0	270 0 0		1892-93	1,400 0 0	1,434 10 4
	1893-94	3,923 0 0	727 8 0		1893-94	990 0 0	1,080 13 4
	1894-95	1,750 0 0	2,396 0 9		1894-95	1,700 0 0	1,875 13 4
	1895-96	260 0 0	1,921 7 0		1895-96	2,680 0 0	1,445 2 8
	1896-97	...	1,365 6 0		1896-97	48,000 0 0	1,574 5 4
	1897-98	...	902 12 10		1897-98	...	1,509 8 8
	1898-99	...	469 0 0		1898-99	60 0 0	3,720 0 0
	1899-1900	...	249 0 0		1899-1900	5,553 0 0	5,870 0 0
	1900-01	...	40 0 0		1900-01	2,165 0 0	3,393 0 0
Total Nerbudda Division.	1890-91	3,440 0 0	2,235 10 3	Bhandara	1890-91	10,125 0 0	3,463 10 4
	1891-92	1,890 0 0	3,107 2 3		1891-92	1,350 0 0	5,002 9 11
	1892-93	7,180 0 0	2,847 2 3		1892-93	4,735 0 0	4,963 4 7
	1893-94	6,700 0 0	4,098 2 3		1893-94	6,665 0 0	3,996 13 1
	1894-95	5,830 0 0	6,478 15 1		1894-95	2,990 0 0	3,396 13 1
	1895-96	1,130 0 0	6,759 0 0		1895-96	2,093 0 0	4,616 0 3
	1896-97	12,857 0 0	4,160 12 0		1896-97	21,465 0 0	3,078 15 8
	1897-98	30,998 0 0	5,433 0 11		1897-98	...	4,923 14 9
	1898-99	673 0 0	11,451 0 0		1898-99	3,040 0 0	6,532 0 0
	1899-1900	10,044 0 0	5,443 0 0		1899-1900	17,085 0 0	4,898 0 0
	1900-01	6,661 0 0	3,577 0 0		1900-01	4,920 0 0	3,487 0 0

STATEMENT E.—Showing the amount of Loans made under the Land Improvement Loans Act (XIX of 1883) in each District of the Central Provinces during 1890-91 to 1900-01—concl'd.

District.	Year.	Amount advanced.	Amount of principal recovered.	District.	Year.	Amount advanced.	Amount of principal recovered.
1	2	3	4	1	2	3	4
		R a. p.	R a. p.			R a. p.	R a. p.
Balaghat	1890-91 . .	300 0 0	725 0 0	Bilaspur—cont'd.	1896-97 . .	66,020 0 0	2,546 14 11
	1891-92 . .	667 5 6	545 0 0		1897-98 . .	59,478 0 0	5,219 9 4
	1892-93 . .	100 0 0	342 0 0		1898-99 . .	2,200 0 0	46,849 0 0
	1893-94 . .	975 0 0	816 8 7		1899-1900 . .	...	12,201 0 0
	1894-95 . .	500 0 0	408 5 6		1900-01 . .	...	133 0 0
	1895-96 . .	448 0 0	239 0 0	Sambalpur	1890-91 . .	270 0 0	2,775 3 3
	1896-97 . .	17,425 0 0	246 0 0		1891-92 . .	350 0 0	3,639 1 9
	1897-98 . .	...	736 0 0		1892-93 . .	150 0 0	3,029 14 5
	1898-99 . .	...	632 0 0		1893-94 . .	1,000 0 0	4,036 4 9
	1899-1900 . .	11,670 0 0	360 0 0		1894-95 . .	700 0 0	2,196 1 6
	1900-01 . .	3,000 0 0	50 0 0		1895-96 . .	660 0 0	1,430 11 2
Total Nagpur Division.	1890-91 . .	10,625 0 0	6,809 2 8		1896-97 . .	10,232 0 0	1,054 0 0
	1891-92 . .	4,867 5 6	8,090 15 3		1897-98 . .	940 0 0	933 0 0
	1892-93 . .	11,235 0 0	8,257 6 11		1898-99 . .	200 0 0	3,002 0 0
	1893-94 . .	11,313 0 0	8,361 11 0		1899-1900 . .	48,970 0 0	3,040 0 0
	1894-95 . .	10,091 0 0	6,939 15 11		1900-01 . .	2,000 0 0	3,338 0 0
	1895-96 . .	5,931 0 0	8,623 2 11	Total Chhattisgarh Division.	1890-91 . .	9,345 0 0	5,751 9 4
	1896-97 . .	1,30,046 0 0	6,910 14 0		1891-92 . .	3,010 0 0	7,234 0 1
	1897-98 . .	...	13,739 10 5		1892-93 . .	4,450 0 0	6,780 0 0
	1898-99 . .	4,446 0 0	19,301 0 0		1893-94 . .	5,310 0 0	8,005 8 11
	1899-1900 . .	62,049 0 0	16,871 0 0		1894-95 . .	4,600 0 0	7,496 7 5
	1900-01 . .	26,991 0 0	15,421 0 0		1895-96 . .	10,160 0 0	6,618 3 9
Baipur	1890-91 . .	4,850 0 0	2,375 0 0		1896-97 . .	99,952 0 0	4,910 14 11
	1891-92 . .	1,660 0 0	2,800 0 0		1897-98 . .	64,253 0 0	7,525 9 4
	1892-93 . .	2,800 0 0	2,445 0 0		1898-99 . .	7,047 0 0	58,064 0 0
	1893-94 . .	1,000 0 0	2,315 0 0		1899-1900 . .	48,970 0 0	18,359 0 0
	1894-95 . .	3,000 0 0	2,735 0 0		1900-01 . .	2,080 0 0	9,505 0 0
	1895-96 . .	5,600 0 0	2,835 0 0	GRAND TOTAL	1890-91 . .	38,303 0 0	16,625 8 11
	1896-97 . .	23,700 0 0	1,310 0 0		1891-92 . .	16,886 13 6	23,370 12 3
	1897-98 . .	3,835 0 0	1,363 0 0		1892-93 . .	27,927 0 0	24,297 0 10
	1898-99 . .	4,647 0 0	8,213 0 0		1893-94 . .	36,204 10 0	27,079 13 2
	1899-1900 . .	...	3,118 0 0		1894-95 . .	24,361 0 0	24,709 6 5
	1900-01 . .	80 0 0	1,034 0 0		1895-96 . .	17,221 0 0	29,950 7 1
Bilaspur	1890-91 . .	4,725 0 0	601 6 1		1896-97 . .	2,54,830 0 0	17,696 10 5
	1891-92 . .	1,000 0 0	794 14 4		1897-98 . .	1,54,501 0 0	33,941 3 7
	1892-93 . .	1,500 0 0	1,305 1 7		1898-99 . .	27,331 0 0	1,15,056 0 0
	1893-94 . .	3,310 0 0	1,654 4 2		1899-1900 . .	1,44,836 0 0	45,986 0 0
	1894-95 . .	900 0 0	2,565 5 11		1900-01 . .	50,047 0 0	33,511 0 0
	1895-96 . .	3,900 0 0	2,352 8 7				

Statistics of Irrigation by percolation.

The Irrigation Commission desires to obtain as accurate information as possible concerning the area irrigated by percolation from tanks, which is not recorded as "irrigated" in the annual land records. They also desire to know the total number of irrigation tanks and wells, because the land records show only the number of tanks and wells actually used for artificial irrigation (other than by percolation) during the year of record.

2. This system of irrigation by percolation is, so far as I know, of importance only in the three districts of the Chhattisgarh Division. The best information concerning its extent is that given in the records of the year of settlement, when the area recorded as "irrigable" includes not only the area receiving water from an artificial channel but also the area irrigated by percolation.

3. A portion only of the Raipur district was regularly settled between the years 1885-1889, so that the statistics do not relate to the whole district. I do not give these statistics for a portion of the district because after reference to the local authorities, I hope to give similar information for the whole district.

4. The Bilaspur district was resettled between the years 1886-1890. The Settlement records for the *Khalsa* portion of the district show the area then recorded as annually irrigated at 78,376 acres. The number of irrigation wells and tanks was—

Wells	3,422
Tanks	7,080

5. The Sambalpur district was resettled between the years 1885-1889. At that time the total area annually irrigated in the *Khalsa* was 106,091 acres. The number of irrigation wells and tanks was:—

Wells	849
Tanks	4379

(*The President*.)—I have to thank you, Mr. Sly, for the very interesting and full memorandum that you have submitted: it seems to embrace almost every subject that we have to deal with. In paragraph 8 of your memorandum you say that "irrigation is not profitable for black soil areas growing wheat, cotton, and juar." This question has arisen wherever we have gone and it is a very important one. On page 19 of his Note on the Hoshangabad District, Mr. Harriott says: "The malguzars were unanimous in their opinion that wheat on black cotton soil can be irrigated with advantage every year if the water is judiciously applied." Have you any remarks to offer on this opinion?—I know Hoshangabad very well. I may point out that the malguzars are of course an interested party, and if they can get Government to construct works for them that will be of use in years of drought, they may be prepared to express their belief in the possibility of continuous irrigation on black cotton soil. But look at their present practice; there are 300,000 acres of wheat in the district, and they themselves have never irrigated more than 2,700 acres and of that 2,700, I know from personal experience that a large proportion is not in the black soil area, but in patches of sandy soil in the district; the actual amount of existing irrigation in Hoshangabad is quite infinitesimal.

1. Q. They might have irrigated more if they liked?—Yes, if it is really as profitable as they wish to make out, they should have done more.

2. Q. Were you here during the famine?—Not in 1896-1897; I was in charge of the Feudatory States of these provinces in 1899-1900.

3. Q. During these dry seasons has the irrigated area of Hoshangabad increased?—It has increased since the famine from 300 to 2,700 acres in Hoshangabad.

4. Q. When were these 300 acres irrigated?—In 1895-96.

5. Q. You say in paragraph 8: "In considering this most important and difficult question, there is one principle upon which I place the greatest importance. This is that no irrigation scheme should be taken up in a tract where its utility cannot be justified by existing agricultural practice in that tract or in a tract with similar conditions." I entirely

6. Similar information is not available for the *Zamindari* portions of these districts.

Mr.
F. G. Sly.

Statistics of Irrigation by percolation, Raipur District.

5 March 02.

In para. 3 of my note, dated the 5th March 1902, I promised to furnish further statistics concerning the irrigation of the Raipur district. In that district, a certain amount of land is irrigated by percolation from tanks, but this is not invariably returned as "irrigated", some members of the land record staff confining the irrigation statistics to areas over which the water is artificially led. The most complete statistics of irrigation are collected at revisions of settlement, when the whole area actually irrigated from existing sources is classed as "irrigable". The greater portion of the Raipur district was resettled in 1885 to 1889, whilst the remaining portion is now being resettled. The settlement statistics available thus refer to two separate periods, and there has undoubtedly been some extension of irrigation since 1885-1889. The statistics are as follows:—

	Irrigated area.	No. of irrigation tanks.	No. of irrigation wells.
	Acres.	No.	No.
Portion settled 1885-89	48,847	5,586	5,142
Portion settled 1901-02	43,075	2,433	2,081
Total for the district	91,922	8,019	7,223

These statistics refer to the *Khalsa* portion of the Raipur district, excluding the *Zamindaris* for which statistics are not available.

endorse that as a general principle, but we have to consider the possibilities of protection against famine by means of irrigation?—Until the last seven years there has been very much greater damage and more famine in the black soil tracts by reason of excessive rainfall than by reason of drought.

6. Q. Could not that be prevented by efficient drainage?—I think not, with any reasonable prospect of success.

Mr. Muir-Mackenzie.—Is the crop of Hoshangabad principally rabi?—Almost wholly. Until the failures of the past five years it was principally wheat, but now they have partly abandoned wheat for gram and kharif.

The President.—If there had been a canal in Hoshangabad do you think the people would have given up wheat?—I don't think they would.

Mr. Muir-Mackenzie.—Would they take water in a famine year?—Yes.

The President.—But not in an ordinary year?—I think in this province the question of the irrigation of black soil is very largely dependent not so much upon the surface soil as upon the sub-soil; if there is a good porous sub-soil stratum it is possible that the soil may stand continuous irrigation. In Hoshangabad the black soil is deep and rests on a bed of stiff reddish clay, which is very impervious. I doubt if that would stand continuous irrigation, although it is exceptionally well drained on account of the unevenness of the country.

7. Q. The Nerbudda river now carries a large volume of water to the sea, and I should like to see it utilized. Can no use be made of it?—That is an engineering question; through Hoshangabad the Nerbudda runs between extremely deep banks and has a very slight fall.

8. Q. It probably would not be useful in Hoshangabad but what about Nimar?—We have the same conditions there, with perhaps a more rocky channel.

9. Q. You say in paragraph 12; "most of the tanks and other sources of irrigation date from the period of

Mr.
F. G. Sly.
5 March 02.

native rule and there seems no doubt that the number constructed under British rule has decreased, although there are still many sites available." Have no tanks been made by the British Government?—No, with one or two isolated exceptions in ryotwari villages. But in the late famines Government made many tanks.

10. Q. In paragraph 13 you suggest that "no enhancement whatever should be made upon land substantially improved for a period of years fixed upon a sliding scale." I understand you to mean that if a man, by taking a loan or otherwise, makes a tank or well, he should be allowed to go on paying exactly the same assessment on his land for a certain number of years, whatever the land has yielded?—I may explain that in the settlement you enhance the rate of rent and revenue of a village upon certain general considerations; if you allow a man's rent on that account to be enhanced, although his land has been improved, he cannot distinguish between the increase made in his assessment on general considerations and that made in his assessment on account of improvements. For instance, if land is paying, say, Re. 1 per acre, and at settlement it is considered that it might be enhanced for rise of apices, etc., to Rs. 1-8-0; if his improvement is estimated at 4 annas, the man's rent is fixed at Rs. 1-4-0 instead of Rs. 1-8-0. But the ryot does not realize that he has been let off 4 annas on account of his improvements; he considers that the rent on the land has been enhanced 4 annas on account of improvements effected by himself.

11. Q. You think it would be better to give him a fixed assessment for a certain number of years than to give him a perpetual exemption as is done in Bombay and Madras?—I think so; in these provinces it would be an unnecessary sacrifice of Government revenue to give a perpetual exemption. But I would recommend a revision of the rules at present in force in these provinces. In the first place I would give an immediate remission on all lands submerged by works of improvement. In addition I would divide all improvement works into two classes, small works and large works: the dividing line might be drawn at works involving a capital expenditure of Rs. 500. For small works I think that our present rules which give an exemption for the next period of settlement are sufficiently liberal, and I would not change them for exemption for a fixed period of years, as this would create a large amount of trouble for small works with re-assessments continually falling in and necessitating enquiry by District Officers. But for large works I would be more liberal. If a malguzar constructs a large work, I would give him an immediate remission of one-eighth of the assessment on the land improved; I would give that remission for a fixed term of years varying with the amount of the capital expended, provided that the area is limited by a certain fixed outlay, say Rs. 12 per acre. I would give him seven-eighths of the existing jama for a fixed period of years on which no enhancement should be made; at the end of that period I am inclined to think it would pay Government to give him a perpetual exemption of one-eighth of the revenue then assessable on the land. That one-eighth would be loss to Government; but it would be a small item, and on the other hand there is a strong feeling amongst the people, which comes down from native rule, that a particular mark of Government favour in the shape of a muafi grant of a fraction of the revenue has a great value, and this would be of more importance than any loss of revenue that would occur.

12. Q. Would you make it a condition that the descendant of the original *muafidar* should be bound to keep the work in order?—Yes; I would make it a condition that the ground on which the exemption is granted still exists and is in proper repair.

13. Q. There is also a suggestion that this concession would not be made saleable except under special condition?—I am not sure that I am quite in favour of putting in that condition; if a man has spent money on improvements I think he should obtain the full advantage of it.

14. Q. You say there is a certain amount of prestige and dignity about being a *muafidar*: would that be sold too?—Yes; I would allow sale of muafi grants for improvements, although the majority of the muafi grants are inalienable in these provinces.

15. Q. What is a *watandari* patel?—He is the managing headman of a ryotwari village who has been given perpetual rights of headship in that village with favourable rates of commission on collections; the ordinary patel may be dismissed at pleasure by Government for any particular reason.

16. Q. Is making him a *watandari* patel considered a compliment?—Yes, he is given *watandari* rights if he makes substantial improvements to a village, founds a new village or the like.

17. Q. Has a malguzar got the right to make a tank or bund in his own land whenever he pleases or has he to go to the Revenue authorities?—If the land is in his own possession he is entitled to do so, but if it is in the possession of a ryot under him he cannot do so without the consent of the tenant.

18. Q. In any instance is the District Officer called in?—The District Officer is only called in in order to adjudicate; if a dispute arises between the tenant and malguzar in regard to the taking up of the land, then the District Officer can only exercise his executive influence to induce either party to come to an agreement.

19. Q. In many cases the water that fills a tank must be obtained from a catchment basin. As long as it comes to his land can the malguzar utilize the water and not pass it on?—Yes.

20. Q. I suppose you would say that for large tanks it would be better to have them the property of Government rather than private property?—If they are really large and substantial I think it is necessary that Government should construct and manage them.

Mr. Muir-Mackenzie.—How large, tanks irrigating about 100 acres?—No, much larger; the limit would not depend so much on the area irrigated by the tanks as on the conditions under which the tank could be made; if a tank could be made wholly in one man's property and only irrigate that, I think he might make and manage a very large tank more profitably than Government could do it, but if it is in land held by several persons it is better that Government should do it.

The President.—It would not often happen that a man would have ground to make a tank which could irrigate 500 or 1,000 acres?—Not now; sites have been exhausted?

21. Q. In that case more villages than one would be involved in the question?—Yes, and therefore it would be necessary for Government to manage it.

22. Q. Would you make it a rule forbidding the construction by a private person of tanks to water more than one village?—No, if a man is willing to make the tank I would certainly let him do it; his self-interest would be sufficient to make him manage it so as to get the greatest profit out of it.

23. Q. I understand that the ordinary tank has deficient waste-weirs and is deficient in many respects?—In the Wainganga valley some tanks have masonry sluices; in Chhattisgarh I do not know of a single masonry sluice, as the tanks are made more for the purpose of irrigating by percolation and not for direct lead upon the lands. This is an important fact to remember in connection with the statistics showing the number of tanks and the amount of lands irrigated every year. The number of tanks is shown as fluctuating from year to year. Our statistics don't show the total number of tanks in a district, but the number of tanks actually opened out for irrigation in that particular year; in fact, in Chhattisgarh, in the best years when the tanks are beneficial a smaller number is shown. The same thing happens as regards the area irrigated; the land irrigated by percolation is not often returned as irrigated land at all, so that a year of best rainfall will show the least area under irrigated crops.

Mr. Higham. When they make a field above the bund is that shown as irrigated?—No, only when water is taken to it by a channel.

The President.—As regards these tanks, by percolation does the wet area extend to any distance?—The average area in Chhattisgarh was put by me at 35 acres; other officers who have more experience of Chhattisgarh have put it at 40 and 50 acres.

24. Q. Do they work any larger area merely by percolation?—Yes; there are tanks working by percolation that will irrigate 400 to 500 acres; it is generally a narrow valley of which the head has been stopped by a bund. In the Wainganga valley they irrigate by means of channels, in Chhattisgarh they don't attempt to make the tank water-tight, but let the water percolate through the bunds.

Mr. Muir-Mackenzie.—Does the water flow along the surface of the fields?—It oozes from field to field; there is no perceptible flow.

The President.—Are these bunds pretty high, 20 feet or so?—Yes.

25. *Q. (Mr. Muir-Mackenzie.)*—From Statement B I gather that you only record as an irrigation well a well from which irrigation was done during the year?—Yes.

26. *Q. (The President.)*—In paragraphs 27 and 23 you allude to the agricultural value of irrigation in the Chhattisgarh country. Mr. Higham and I have discussed this matter and we spoke of the advantages of starting as early as possible large reservoirs; it seems there are some excellently worked out projects in these provinces. In what part of the country do you think it would be best to start construction—in Wainganga or Chhattisgarh?—The most important from a Government point of view would be Chhattisgarh, because it is not such a fully irrigated tract, it cannot stand famine as well as the Wainganga valley, and there are more important problems to solve there in connection with irrigation. There is one difficult question regarding which I have expressed an opinion in paragraph 26. In Chhattisgarh the whole of the rice at present grown is broadcast; we have to learn whether the reason is any inherent defect in the soil or whether it is purely and simply a question of the supply of water and energy on the part of the cultivators. There is one broad fact brought out by Mr. Fuller, which shows that the whole of the transplanted rice country in the Central Provinces is soil of crystalline formation and the whole of the broadcasted is sandstone soil. Whether this accounts for the difference of practice has yet to be proved.

27. *Q.* Do you know any particular projects in Chhattisgarh to which you would give prominence?—No, I have not seen any of the projects.

28. *Q.* Would the Ramtek project be a good work in your opinion?—I don't know the country at all well, but I believe the black soil is upon a bed of laterite which is extremely porous; there seems no *prima facie* reason why irrigation should not be successful.

29. *Q.* It seems from the technical side to present great advantages?—It is on the border line of rice cultivation; it is possible if irrigation was given there, that the rice cultivation of Bhandara would extend its limits into that country.

30. *Q.* Supposing Government created a new reservoir or tank and charged simply a water-rate per acre to every person who took water, I suppose there would be no question about their right to do that?—I think not.

31. *Q.* It might probably be easy to arrange with malguzars or owners of small tanks to supply water to their tanks at a certain rate?—Yes. Under Mr. Harriott's scheme, in which he proposes to form Government works to fill small tanks, there will be some difficulty in deciding how Government is to obtain payment for the water that is given to the tanks; the only way in which Government can recoup itself for the expense is by fixing a lump rate of so many rupees for filling the tank and leaving the distribution and management to the owner of the tank.

32. *Q.* And leaving it to the option of the owner of the tank to buy the water or not?—Yes.

33. *Q.* You say at the end of paragraph 30: "It would seem that in Chhattisgarh a water-rate of Re 1 per acre may safely be estimated at the commencement which may be raised to Rs. 1-8-0 and then to Rs. 2." We have discussed elsewhere the expediency of starting with low water-rates, and I think the feeling has been to fix full rates at once and make remissions for a certain number of years; would you agree to that?—I should like to know whether your question applies to water-rates at so much per acre or to a fixed rate year after year in addition to the assessment.

34. *Q.* The question arose chiefly in connection with water-rates in Northern India. That rate I understand would be optional, that is, it is only charged if the cultivator takes water?—Here I propose to have a fixed rate—a wet rate assessment which the cultivator would have to pay, whether he took water or not.

Mr. Muir-Mackenzie.—You don't think there would be any difficulty in recovering water-rates under the existing law?—No; please see paragraph 30 of my memorandum.

The President.—You say in paragraph 34 that the cultivation of sugarcane has decreased: is that generally the case?—Yes, throughout the province.

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35. *Q.* Why is that, it is a very valuable crop?—There are many reasons: the province is being opened up by railways and there is the competition of imported *gur* from the North-Western Provinces and elsewhere, where it is made cheaper than in these provinces. Then sugarcane cultivation is expensive and can only be taken up by a substantial man; perhaps the famine may have made it unpopular on that account. Cane requires also a good deal of wood and other forest material for fencing, etc., which perhaps people don't get as cheaply as they did in the old days.

36. *Q.* You allude in paragraph 38 to the Nerbudda valley; this is a tract that suffered terribly in the famine?—It suffered very severely, but not as severely as other parts; Hoshangabad has an extremely bad record.

37. *Q.* The conclusion you have come to is that, as far as irrigation is concerned, nothing can be done there to help the situation?—I would not express myself so decidedly; irrigation in that tract should at present be confined, if it is started, to experimental measures—to see if the soil is suitable and whether it will take water continuously.

38. *Q.* There is another point on which I don't think we have got anything like satisfactory information; that is whether the lie of the country would admit of irrigation?—It is a rolling country and the rivers are very deep.

39. *Q.* Mr. Harriott's map shows a certain amount of rice cultivation above Hoshangabad?—Yes; along the bank of the Tawa river, there is some inferior broadcasted rice cultivation; it is merely a catch crop.

40. *Q.* In paragraph 39, referring to the Nimar district, you say: "I am not in favour of the construction of wells by Government, for the people can themselves construct them at less cost; but I would give Government assistance in the shape of expert advice for the selection of unsuitable sites, trial boring, and the use of boring tools." Is there much scope for the extension of well irrigation throughout the province generally?—I don't think so, but there are some tracts in the province where *prima facie* it seems that well irrigation might profitably be carried on to a much larger extent than it is at present. Nimar is perhaps the most hopeful of the lot.

41. *Q.* Do the people take kindly to wells?—In Nimar they do. In the Nimar district, there are 14,000 acres of well irrigated land, which is much more than in any other part of the province; out of a total of 24,000 acres under wheat, 10,000 acres are irrigated from wells.

Mr. Muir-Mackenzie.—Not in black soil?—Yes, it is almost entirely black soil in the Nimar district, but not rich black soil.

Mr. Craddock.—Is it not the case that in Nimar black soil will not produce wheat without irrigation?—Yes, almost entirely.

42. *Q. (The President.)*—If the Deputy Commissioner of Nimar was authorised to give freely *takavi* grants, would there be a rush for them?—I think so and a considerable extension of wells; in Nimar the cultivators are men of good means and of distinctly good character who would be prepared to improve their lands and who would have the energy to take advantage of wells if they were made.

43. *Q.* We have been met by the difficulty that the District Officers have not the time to attend to giving advances, and it has been recommended that there should be a special establishment for the purpose. Would you advocate that?—In cases where there seems a probability of a large number of applications being received, I think it would be worthwhile to put an officer on special duty to encourage them and to deal with applications on the spot so as to get rid of a considerable amount of delay which does occur, our present staff having to do the work in addition to their own duties.

44. *Q.* All things considered, from your knowledge of these provinces, what measures do you think should be taken to protect them from another famine?—Extension of irrigation, more particularly in the rice tracts, both by Government construction of large works and by the encouragement of the construction of small works by the people themselves.

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45. Q. What is required for the black cotton soil tracts? Could anything be done there?—They suffered less from famine than the rest of the tracts perhaps. In Nagpur and Wardha I very much doubt whether irrigation is possible and I don't think there is any other alternative that can be suggested; in the northern part of the province the question of irrigation is perhaps more an open one, but even putting that aside there is the possibility of extending the system of bunding wheat fields. That is a question on which it is difficult to give a definite answer, but there is the broad fact that at present the system of bunding wheat fields exists in three or four separate parts of the province; it is marked out by well defined limits, inside which you will find the majority of the fields bunded and outside none; why the system is not universal it is difficult to say. Mr. Harriott says it has extended in the Saugor district and also in Hoshangabad; my own belief based on my experience about six years ago and on what I have heard from the people since, is that the amount of bunding in Hoshangabad is practically nothing; I think you might count the number of bunded fields on the fingers of both hands. Whether it is possible to extend it profitably it is difficult to decide. Past practice would seem to say no. There is a distinct difference in the soils in the areas where bunds exist and where they don't exist; in the bunded fields the soil is distinctly more tenacious and of a more sticky nature, and holds well in bunds; in the unbunded parts the soil is friable and the bunds won't stand. A malguzar in Nagpur tried it outside the bunded area, but failed as the bund would not stand. Mr. Harriott thinks that where bunding is profitably carried out, it would be profitable to have irrigation. I am not sure that this is a sound conclusion, for bunding is very much more than irrigation; it amounts to flooding the field practically through the whole of the rains; it therefore largely aids the disintegration of the soil and increases its fertility without ploughing; it does away with the necessity for all monsoon preparation of the land; it kills the weeds and the land is ready for the crop without any previous preparation at all; the field gets all the nitrogen brought down by the rainfall. The only conclusion in favour of irrigation that you can draw from the analogy of the bunded system is that it is an advantage to have a wet seed bed in October to put your wheat in. In bunded fields there is more liability to rust in damp years than in unbunded fields.

46. Q. As regards wells, would you advocate their extension?—Wells in the Nerbudda valley except in Nimar are very deep; the soil is such that the well must be made *pakka* at considerable cost. I am not very sanguine that there will be much extension in that tract.

47. Q. What about Saugor and Damoh?—I know very little about those parts.

48. Q. (Mr. Higham.)—You say in paragraph 13, "The terms might be made more liberal for large works." Is there any difficulty in the case of fairly large works in obtaining the consent of all the persons concerned, supposing the work was for more than one village?—Yes, for large works that extend over more than one village, it would be difficult to get them to combine.

49. Q. Do you think that any kind of legislation is necessary or desirable to overcome that difficulty?—I would legislate to permit the acquisition of land by private persons for the construction of an irrigation work that was approved by Government.

50. Q. Would that be a special Act or would it be an amendment of the present Act?—It would either be an amendment of the Land Acquisition Act or a clause in any special Irrigation Act that might be passed for this Province.

51. Q. I suppose there would be some charges for the use of water to cover maintenance and repairs, etc.?—I don't think it would be advisable for Government to legislate to enforce payment to owners of private works of water-rates; at present it is managed by the owner of a tank in accordance with village custom, which he is obliged to respect. There are not many complaints about difficulties in regard to management.

52. Q. Then it is only necessary to take power for acquiring land?—Yes; for the construction of tanks and for water channels which it would be necessary to make.

53. Q. I suppose it would only be necessary to acquire the right to occupy these lands and not expropriate the owners. Under the Land Acquisition

Act you have to transfer the title?—Perhaps the people might like it better if you acquire only the right of occupancy.

54. Q. In the Punjab when land is taken up for a water-course merely the right-of-way is acquired through the land, for which compensation is paid. If the water-course is not used for 3 years the right lapses and the land reverts to the owner?—I think that arrangement would be quite sufficient in this province.

55. Q. With reference to the proposals in paragraph 13, to give exemption for a series of years from increase of revenue, what will happen if works are not kept in an efficient state of repair?—There should be a condition attaching to the exemption that if a work fails, owing to want of repair or any other reason, exemption shall immediately cease.

56. Q. It seems to me that in these parts when you have a succession of good years, these means of irrigation are apt to fall into disuse?—I don't think that is the case. I have never known a case where a tank has been allowed to go into disrepair, because it is not used for purposes of irrigation in good years; if it has gone out of repair it is owing to its not being useful, or it has failed in the object for which it was made or perhaps the owner has become impoverished and unable to meet the large expense required for keeping it up. As a matter of fact most tanks in these provinces are used every year for irrigation to the fullest extent possible. The fluctuations shown in the statistics are due not wholly to actual fluctuation in the areas irrigated, but to our method of records in the matter of percolation.

57. Q. What is the limit for which you may expect private owners to make tanks; would they work up to 500 acres?—Probably 500 is an outside limit.

58. Q. For anything beyond that it would be good for Government to make the tank?—Yes, particularly if the area extended over more than one village. There are very few places in this province in which it would be possible to make a new tank that would irrigate 500 acres in any single man's property.

60. Q. The difficulties you refer to in paragraph 16 I suppose would be almost entirely met by the legislation you have just referred to?—Yes, for irrigation works that are capable of being constructed by the people and are more or less confined to the property of a single owner; but that would not meet the case of large irrigation tanks, which Government must step in and make.

61. Q. In paragraph 30 you say, "I know of no legal power which the Central Provinces possesses for imposing a water-rate without first obtaining the consent of the cultivators." There is nothing to prevent a water-rate being imposed under the Northern India Canals Act (VIII of 1873), which applies to the Central Provinces?—Under that Act you can only impose a water-rate for lands that are actually irrigated.

62. Q. The original idea was to impose in addition to that a compulsory insurance rate to be paid for all lands irrigable by the works. The Secretary of State refused to sanction a compulsory rate. You can only now charge a water-rate on land actually irrigated in any year. There is nothing in the Act saying that water-rate can be charged only with the consent of the owner, but there is no difficulty in Northern India. A man cannot get water on his field without some action of his own. In Bengal no charge can be made for water unless you have an application in writing beforehand. Since that Act applies to the Central Provinces it would be possible for you to introduce a water-rate omitting the wet-rate that you are now contemplating?—Yes.

63. Q. You could impose certain water-rates without asking for anybody's consent by a notification of the Local Administration; not the fixed rate you contemplate, but could you not compound for a fixed rate on a lower scale?—I think that could be done.

64. Q. If they declined to compound you could enforce the higher rate?—Yes.

65. Q. Do you think they would generally prefer to compound or stick out?—They would prefer to compound.

66. Q. That would get over the difficulty?—The difficulty that would occur is that in Government making a number of tanks which are comparatively small irrigation works, if they are to charge a rate on the area irrigated each year, the expense of establishment would be very high.

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67. Q. I agree that the other system is better. I suppose it would be quite possible to amend that Act so as to empower the levy of a water-rate of the kind contemplated by you?—I think so.

68. Q. That course was objected to by the Secretary of State in Northern India, but that was because there was no restriction; in this case you only take power to impose a rate on a defined area to which you would practically guarantee protection?—Yes.

69. Q. I don't see why you require to enter into an agreement with cultivators?—Not if we have legal power outside the agreement.

70. Q. In the same paragraph you say, "It would seem that in Chhattisgarh a water-rate of Re. 1 per acre may safely be estimated at the commencement, which may be raised to Rs. 1-8-0 and then to Rs. 2." Would you in that case set forth that you intended to work up to Rs. 2?—Yes.

71. Q. It seems to me that the allowance for collecting the water-rate of 2 annas in the rupee is extremely high?—It is the ordinary rate of allowance given to the malguzar in these provinces for the collection on behalf of Government of dues payable by persons other than himself in his village.

72. Q. In Northern India we allow the heads of villages 3 per cent. and many people have thought that too high?—I suppose much depends on the amount of the assessment.

Mr. Rajaratna Mudaliar.—In Madras we allow 10 per cent.

73. Q. (Mr. Higham).—From your remarks I infer that you are not in favour of the Ramtek project being taken in hand?—I am in favour of its being taken in hand as an experimental measure to see the value of irrigation in black soil, on condition that the money applied to it is not withdrawn from more certain and more favourable schemes in the rice country. If the Government of India are prepared to provide funds outside their ordinary grant for the Ramtek scheme, it would be very advisable to take it up; if it means the postponement of other works in the rice country I would not advocate it.

74. Q. There would be no difficulty in providing money if the work is likely to pay as well as is anticipated in Mr. Harriott's Note? Do you think that estimate too sanguine?—I have never seen the estimate.

75. Q. Speaking of irrigation works in the Nerbudda district you would only propose irrigation works there as an experimental measure in black soil. There must be places in which a permanent supply of water is available; it is a question whether a certain area might not be put under irrigation by means of steam pumps or lift, thus avoiding the heavy capital expenditure. The objection to a pump is that it involves heavy annual charges, but that expenditure would vary with the demand for water; if there was no demand the pumps could be utilized elsewhere; another point is that when water has to be pumped extreme care is taken to secure economical distribution. Thus if sites were suitable pumping installations might be useful?—I am not an Engineer, but it seems to me that the country does not lend itself to any large canal scheme. The only possibility for gravitation works would be to have reservoirs in the smaller streams running out of the Satpura hills with short canal channels along the ridges to the Nerbudda. I should like to see a steam-pump tried as an experimental measure, and it could be easily worked from one of the rivers.

Mr. Muir-Mackenzie.—There is one discrepancy between your return and Mr. Harriott's; take the district of Jubbulpore. The rainfall in the driest year is put by Mr. Harriott at 13.39 you show it in 1899-1900 as 36.90?—I did not attempt to take out the driest year—I merely gave the returns for the two famine years. My statement does not pretend to show the driest year of rainfall.

76. Q. In the statistics of tanks and wells I find the increase of durable wells is fairly continuous all the way through; are the figures correct or are they vitiated like the tank statistics?—No, well is recorded as an irrigation well unless it has been used for irrigation in that year; these statistics show clearly that year after year more wells are being used for irrigation; whether they are old wells or new wells that have since been constructed for purposes of irrigation the figures would not show.

77. Q. Then we may take it that, as these statistics show, there has been a considerable increase in the use of wells throughout the province as a whole; and that the increase is not confined to certain divi-

sions. Would you not say from that that some encouragement might be given to the extension of wells even in Chhattisgarh?—It might be worth while to encourage the construction of wells in Chhattisgarh for the irrigation of crops other than rice.

78. Q. Is the small amount of well irrigation in these tracts due to backwardness and want of enterprise on the part of the population?—I doubt if you can put that forward as a general conclusion; if that were so you would see instances of the more enterprising cultivators taking to well irrigation in advance of their fellows, but that is not the case.

79. Q. Do you think the country is as fully developed in Chhattisgarh as in Nerbudda?—No.

80. Q. Is there not a large area of culturable waste in the province?—No; the limit of profitable cultivation has been reached in the majority of the districts.

81. Q. Do you not think that the backwardness of the province generally is due to the fact that there has been so much land for the people to get that there has been no pressure on it?—Yes; I would like to qualify the statement made in the fifth paragraph of my Note that there has been no obstacle to the extension of irrigation arising from sparsity of population. I think in the past it has been a distinct obstacle to irrigation. With an increase of population the cultivator must either extend his holding or cultivate more intensively. Until recent years there has been sufficient land for him to extend his cultivation without going in for more intensive cultivation. I think this still applies to the plateau districts and the wider parts of the province, but not now to the more fully populated rice tracts. In the Wainganga valley and in Chhattisgarh the pressure of population on the land has been sufficient to induce the people to take up all methods of profitable irrigation within their means.

82. Q. How long has this condition obtained on the Wainganga and in Chhattisgarh?—Within a period of say, 15 years.

83. Q. The pressure is only just beginning?—Yes, and the pressure has been made more acute by the long series of bad seasons that have followed. A man may have a holding of 10 to 20 acres which supported him in former times, but it will not do so in bad years and he is consequently much more keen on irrigation at the present time than ever before. There is a distinct feeling among the people that it is now necessary to go in for more irrigation than formerly.

84. Q. Your view as regards the best protective measures in these tracts is the construction of large works by Government with an assured storage supply?—Yes.

85. Q. In the next place you would encourage the digging of smaller tanks?—Yes.

86. Q. Would not all these tanks fail in a year of drought?—Not all; it would be possible to get a certain number of tanks that would carry through a year of drought, and if they failed there are years of comparative drought in which it makes all the difference between a famine and a fair crop.

87. Q. Would 1896-97 be an example of such a year?—It was more than a year of comparative drought; even in that year the existing tanks did enormous benefit and saved a great deal of crop that would have been lost.

88. Q. Did they cause less need for relief in Chhattisgarh than in other Divisions?—I cannot say. I was not here, but it is on record that they did.

89. Q. Mr. Craddock.—They required very much less relief in Chhattisgarh in 1896-97 as compared with 1899-1900. In the Wainganga valley there was practically no relief required in 1896-97; it was confined to the non-tank portion in Balaghat and Bhandara?—In Chhattisgarh tank irrigation is insignificant, but I heard from the Settlement Officer that wherever they had tanks it made all the difference.

Mr. Muir-Mackenzie.—Generally all over the province in 1899-1900 these tanks irrigated a very small area?—Yes.

90. Q. Must we not come to the conclusion that the great majority of the tanks would hold no water and be of no use in a year like that?—Yes, but they are of the greatest value in a year which just falls short of that.

91. Q. Would it not be better to trust to wells from a protective point of view? Would they not hold water in the worst year?—Well irrigation in these provinces for rice cultivation is almost impracticable,

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the present agricultural practice in these provinces shows that well irrigation for rice is not carried out at all.

92. Q. The general rule is that their tanks have been full?—Even in years when tanks have not been full they have never resorted to wells.

93. Q. Their tanks have always been full, except in 1899-1900, when they proved a broken reed; did that year stimulate them to use wells?—No.

94. Q. The experience of one year was not sufficient to teach them a lesson?—No; the possibility of well irrigation for rice is extremely small.

95. Q. Just over the border, in Hyderabad, there is a great deal of rice irrigation from wells?—It would be necessary to find out the conditions prevailing there. The crops may be heavier and more valuable; there may be much depth of water.

96. Q. If you say that the depth of water is too great or that the wells give out I can understand it, but they seem to hold water when tanks do not, and so I do not understand the despondent view you take?—I have not examined the statistics very well, but I think you will find that the depth of water in Chhattisgarh is pretty considerable.

97. Q. Is there any reliable information as to the depth of sub-soil water in the different parts of the province?—I don't think so.

98. Q. Would it be worth while to have a systematic examination made?—I think it would be very useful.

99. Q. If it were found that water was available for large tracts of Chhattisgarh within easy reach of the surface, would you take an equally despondent view as to well irrigation?—I am inclined to think I would. I think it would be impossible to induce the people to lift water for rice.

100. Q. In Chhattisgarh would the people not be inclined to make wells in the area outside tanks?—They have not done so in the past.

101. Q. Would you not like to see wells under the ayacut of tanks, so that when tanks fail they might give one or two waterings and thus save the crops at the end of the year?—I am not sure that a well underneath a tank would hold very much water. In connection with this question, I may point out that in certain rice districts, more particularly in Sambalpur, well irrigation is not unknown; it is practised for sugarcane cultivation, as far as I remember.

102. Q. Only for sugarcane and not for rice?—Yes. They use it for sugarcane cultivation, which pays them. But they do not use it for rice. If it were profitable why don't they use it?

103. Q. It may be possible that it has not occurred to them. In Madras, there are thousands of wells under tanks for this very purpose?—I do not know the conditions under which well irrigation is used for rice in Madras. I should imagine that it is a very much better kind of cultivation than the rice in the Central Provinces, which perhaps, may account for its being profitable to raise water from wells.

104. Q. Do you think, judging from the rates in Madras, it is possible that the outturn here may be such as to make it profitable to use wells?—I doubt if it would be possible.

105. Q. Is the rice under tanks transplanted?—In the Wainganga valley the whole of it is transplanted.

106. Q. In Chhattisgarh?—Only about 5 per cent.

Mr. Rajaratna Mudaliar.—It is precisely the same system that is followed there and it is in reference to such crops that well irrigation applies.

Mr. Muir-Mackenzie.—Suppose you had a few thousands of rupees placed at your command, would you not be inclined to encourage these experiments?—I will be quite pleased to do it. If it is practised in other parts successfully, we ought to try and see if it cannot be done here.

107. Q. Have you had any work in the distribution of *takavi*?—Not for many years.

108. Q. From your Statement E I should gather that the amount of *takavi* that is generally distributed in this province is decidedly small. The largest amount given for land improvement is in the year 1896-97 when it was 2½ lakhs. In some of our Bombay districts even before the famine we gave out as much as 1½ lakhs a year.

The President.—In one district?

Mr. Muir-Mackenzie.—Yes, in the Carnatic district. In one district in a division we gave Rs. 25,000 a year. Even if there had been no Irrigation Commis-

sion we hoped to have increased the amount. Don't you think there is room for large extension?—Yes.

109. Q. Do you think that if you had a larger amount at your command more could be distributed?—Yes.

110. Q. Has there ever been any shortage of allotment? Have you ever been unable to obtain the full allotment?—As I understand the position of this province, the whole of the money available in the shape of loans in recent years has been given—it is more profitably spent—in seed loans to cultivators.

111. Q. That is in famine years?—Every year during the last 4 or 5 years.

112. Q. You can't speak of the time before that?—I cannot.

113. Q. Can you tell me whether the practice of embanking wheat fields has been extending or contracting in recent years?—I believe Mr. Harriott says that there is a tendency to extend it in Saugor. That is the only part that I know where it has been extended.

114. Q. You don't think that if money were liberally placed at your disposal it would be considerably extended?—It is very doubtful whether it could be considerably extended. One is not sure of the conditions suitable for embankment.

115. Q. If you had larger sums placed at your disposal for *takavi*, how would you spend it, would you spend it almost all on tanks?—I would spend it firstly on tanks and secondly on bunding wheat fields in tracts where it is at present successfully carried out.

116. Q. On wells?—Yes, particularly in Nimar.

117. Q. Are there any other districts, in which it can be done successfully?—Wells might be possible and advances for wells might be given in some of the plateau districts, more particularly in Betul, which has a certain amount of well irrigation.

118. Q. You say that if exemption of improvements from taxation were allowed, of improvements only, people would not generally understand its effects. Mr. Chitnavis said yesterday that people were beginning to compare the assessments of different holdings and they were beginning to understand a good deal about it. Do you think there is any truth in that?—It may be possibly true so far as the more intelligent and larger landowners are concerned.

119. Q. A *malguzar* would at any rate understand it?—Some might.

120. Q. Not the generality?—The generality would not. Not one in a thousand would understand it.

121. Q. How much of your advances is given for land improvement?—A very small percentage.

122. Q. Do you think that any misapprehension of the system stands in the way of your giving advances. You don't think that there is any special difficulty in making advances to tenants?—No.

123. Q. The amount that is given to different classes of holders is limited by rules. For instance, to an ordinary tenant you do not give more than three times the rent?—I do not think that is quite a correct statement. The rule provides that the amount of loan must be covered by the value of the interest in the land possessed either by the person applying for the loan or by persons who have given security for him.

124. Q. Then it would be possible to give him more than a certain multiple?—The question of multiple occurs only in a case where the person applying for the loan has himself no interest in the land to offer it as security, but offers as collateral security the lands of other tenants.

Mr. Craddock.—The rule is—"When the person making the applications for the loans has no interest in land to offer as security, a loan may be made on the joint personal security of not less than three occupancy tenants. Provided that the total amount of any loan made under this rule shall not, without the sanction of the Commissioner, exceed three times the total annual rental paid by such tenants on their land held in occupancy right. For loans made under this rule a bond in Form E shall be taken from the persons giving security."

Mr. Muir-Mackenzie.—One of the reasons for the delay in the disposal of applications is the necessity for enquiring as to security?—Yes.

125. Q. That is the principal reason you think?—There are two reasons of equal importance; first, the enquiry into the security; second, the enquiry into the necessity for, and the value of, the improvement.

126. Q. Do you think it is necessary to enquire into the value of the improvement, if you know that the

man is going to spend the money for the purpose for which it is given?—Not as largely as it is done at present. As far as I know, the present custom is: papers are sent to subordinate revenue officials who have to go to the spot and personally enquire whether the improvement is an advisable one and whether the man is likely to spend the money for the purpose for which it is given and whether the security that he gives is sufficient. As far as I know, practically there is a local enquiry in the village.

127. Q. Under your plan for exemption of improvements, which you stated in answer to the President, and in which you said that you would have more liberal terms given for large works, you draw the line at works costing Rs. 500. If that be carried out, I am afraid wells would practically escape exemption?—They would escape exemption under the more liberal rules recommended by me for large works, but would be exempted as small works under the existing rules.

128. Q. Don't you think that it is worth while to protect wells by exemptions?—The present terms are not illiberal, and I do not know that they are not sufficient.

129. Q. What you are anxious to do is to get small people to dig wells as protection against famine?—The question does not enter into the case of a man digging a well as much as the case in which a man digs a tank, because the man that makes a well makes it purely for the benefit of his own land from which he expects direct profit from increased cultivation under that well; but a man who makes a tank makes it, generally speaking, not only for the purpose of irrigating his own land, but also for irrigating the land of his tenants or of other people. He does not get such a large return from his tank work as that which the other man would get from his well.

130. Q. Does he not dig the tank in expectation of increased rents?—He does get increased rents, but that is a very small share of the increased produce that results from irrigation.

131. Q. Is there any chance of making a tank if there is no chance of getting a fair return?—I think that a majority of the tanks in the Central Provinces have been made quite as much from motives of charity and pressure of public opinion as for material profit.

132. Q. That is the only ground on which you would hope for considerable extension in future—charity?—Now-a-days the benefits of irrigation from tanks are very much better appreciated than they were formerly. The motive of charity is one of the reasons why I thought that there would be a charm in turning all of them into muafidars, as it would appeal to the religious element rather than the element of gain.

133. Q. Another reason that you gave for not extending this exemption to a smaller class of improvements, was that a great deal of trouble would be entailed in the matter of making settlements. I do not quite understand what trouble would arise?—In a particular district that comes under settlement, the Settlement Officer has to fix the rental value of the land. If there is an exemption for a period of years the rental value has to be altered at the end of that period, so that the Deputy Commissioner would continually have to deal with cases in which the exemption period has expired and in which it is necessary to give notice to people and inform them that the rent has gone up.

134. Q. There is that same sort of trouble in anything that you give exemption for at the end of the next settlement?—No. That works automatically at each settlement. When a new settlement is made the Settlement Officer settles it straight away. Suppose there is a small holding the rental value of which is Rs. 10, but on account of improvement it is fixed at Rs. 8 for a period of 5 years, after the fixation. At the end of those 5 years, the Deputy Commissioner will have to get the register of these exemptions and serve notice to the party concerned that his rent has now been increased from Rs. 8 to 10. If these cases become numerous, they cause a great deal of trouble. Directly you go in for fixed periods of years, which keep continually varying, you will have cases continually cropping up, from year to year, of exemptions running out and full assessments being due.

135. Q. How the thing is worked in the Punjab is that they do not give exemption as you propose, but they exempt them from enhancement for a fixed period which might terminate at the next settlement. Do you think such a thing is workable? Do you think that mere trouble should prevent you from giving them exemption, if the grant of such exemption would

induce them to make improvements?—I do not think that mere trouble would be a sufficient reason. That is only a subsidiary reason; my main reason is that the present rules are quite liberal enough for small works and the period of exemption granted under the present rules is quite a sufficient recognition, and is not an insufficient motive for one to undertake them. But in a case where a man has to make large works and incur a deal of expenditure, not for his own immediate benefit, I think he is deterred by the question of assessment.

136. Q. I see that in these late years, the number of *kacha* or non-durable wells has contributed a good deal to irrigation. Were these wells made in fairly large numbers in consequence of famine with the hopes of having a catch crop or fodder crop?—I cannot say. I was not here during the famine. As far as I know there was no particular tract in the province in which there was any extraordinary extension of well irrigation during the famine. My own personal experience after the famine goes to show that small numbers of wells were made throughout all the districts rather than there being a special impetus given to their construction in any particular tract.

137. Q. It has been brought out, I think, that in practice the period of repayment for *takavi* seldom exceeds 15 years. Do you think that state of things ought to be altered and the period of repayment should generally be made as nearly equal as possible to the full period of 35 years?—In particular cases I think the discretion given by the rules might be more liberally worked, but I do not think that there will be any large advantage arising from a general lengthening of the time.

138. Q. Don't you think that people would be more ready to take loans if they are permitted to repay them in a longer period?—No, except for large loans for large works. The general wish of the cultivator is to try and repay the loan in as short a period as he can.

139. Q. Mr. Chitnavis and a *malguzar*, whom we heard, favoured long periods?—I have not heard much complaint from tenants about the period.

140. Q. With reference to the obstacles to extension of irrigation mentioned in paragraph 16, you don't mention the obstacle that is met with elsewhere, that is, people lower down an irrigation system objecting to the allocation of water to the people above them without even the ground that their own supply is diminished, but simply on the dog-in-the-manger system and on the ground that the only people that have a right to the water are themselves, and no outsider has any right to receive it. Is there any such obstruction occurring?—It does. I have heard of it, but not in numerous cases. In Chhattisgarh, more particularly where the "tar" system has been introduced, they object to let the channels be made across the villages.

141. Q. Would you kindly describe the "tar" system?—As far as I have seen it, it consists generally of a bund across the head of a *nalla*, which catches the water at a fairly high level whence it is taken by a plain earthen channel along a ridge as high as possible and as far as the water will run and the fields are irrigated on both sides.

142. Q. Are these bunds thrown up fresh every year or are they permanent?—They are thrown up every year.

143. Q. You don't think that it would be necessary for Government to acquire rights over water in the same way as they acquire rights over land, so that they may control the distribution of water?—I think not. As far as I know in this province, the Government has already got a right over water in navigable streams and rivers. There is some section in the Land Revenue Act about it. As for the control of water-supply in tanks and in drainage areas my belief is that any interference by legislation would do much more harm than good by helping to break up and throw into confusion the system which is at present very well managed by village custom.

144. Q. All the village customs are recorded in *Wajib-ul-arz*?—Yes.

145. Q. In what way can you enforce a custom?—Under the Land Revenue Act, under which a custom can be notified by the Deputy Commissioner, and if a person breaks that custom he is liable to be punished with a fine.

146. Q. The existence of that provision is sufficient to see the custom enforced?—Yes.

147. Q. I gather that there are plenty of sites available for new tanks?—Yes.

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148. Q. For private tanks?—Yes.

149. Q. Do you think that it would do good if any sort of survey is made or if the people receive some assistance from the Public Works Department as to where they should construct their tanks?—Yes, for large works the Public Works Department may give very valuable assistance. But in the case of small village tanks I do not know if the assistance of the Public Works Department would be of great benefit.

150. Q. If a man is going to spend as much as Rs. 1,000 do you think it is worth while to give him that assistance?—If he got expert advice from an irrigation Engineer, I think it would probably be useful.

151. Q. But what about such expert advice as could be given by subordinates?—I do not know that it would be of great advantage. There are expert tank diggers among the people themselves who are extraordinarily good at laying out levels of channels and bunds. Any malguzar who wishes to build a big tank collects a body of these experts round the spot where he proposes to build his tank, has a talk with them over it, and decides what the levels ought to be and what the height of the bund should be.

152. Q. You say in paragraph 20 on page 7 that tanks are often kept in a bad state of repair, particularly where the owner has himself little or no land below the tank and so on. I should infer from that that the existing law is hardly sufficient to enable you to compel an owner to put the tank in good repair. Don't you think that further powers are required?—I don't think so. If the present powers are used freely, I think they would be quite sufficient. In any particular case where you may have to deal with a recalcitrant owner who refuses to repair the tank, the advantage you would gain by further legislation would be very small as compared with the danger of interfering with existing village customs.

153. Q. You think that the complaints often received by Revenue Officers are from ryots that the malguzars won't allow his tank to be cut. You send an officer to inspect the place and submit a report and a malguzar may be ordered to cut the tank and allow so much quantity of water. If he does not obey your order can you enforce the custom under the Wajib-ul-arz?

Mr. Craddock.—But he can bring a civil suit to set it aside.

Mr. Muir-Mackenzie.—Considering how valuable these tanks are as a measure of protection against famine in tracts exposed to it, do you think that if a general notification was made that the Government would never take any wet rates on account of improvements effected by the construction of tanks people would understand it and that it would give a considerable stimulus to their construction?—I think it might.

154. Q. The thing was somewhat pressed elsewhere that if a man made a tank and took water from a stream the Government should not charge any royalty on that water and that fact should be made widely known. Would you not be prepared to go so far as that to encourage people to protect themselves?—I think it is an unnecessary sacrifice of revenue.

155. Q. Would the sacrifice be much?—What percentage of revenue would that come to?—It might at present be estimated roughly at Re. 1 per acre.

156. Q. Suppose you had 500,000 acres, don't you think it is worth giving up 5 lakhs?—It is 5 lakhs a year.

157. Q. Yes?—I do not think it would be a sufficiently strong stimulus to justify the sacrifice of so much revenue.

158. Q. If that is proclaimed every where don't you think it would rather strike them as being really something good?—I do not think it would be such a strong stimulus as a personal distinction or as an abatement of a fraction of their assessment. In Bombay you exempt the improvement perpetually.

159. Q. We exempt them perpetually, but that is a different thing. Like other provinces, we are not altogether consistent. If a man takes water from a stream the theory is that the stream belongs to Government and the water taken therefrom must be charged for. It has been suggested by many people that we should not do that in areas exposed to famine in order to encourage people to utilise water as much as they could, and that we must tell them that we would not charge anything for the water so taken?—I am under the impression that although you exempt improvements you do take a wet-rate or an irrigability rate.

160. Q. We take sub-soil water assessment in one part of a particular district. But that is stopped?—I

was under the impression that you took sub-soil water advantage rate all over the presidency.

Mr. Rajaratna Mudaliar.—In the Madras Presidency there is no charge. The land is classed as dry and even in the revision of settlement its classification is not altered.

Mr. Muir-Mackenzie.—In what way will you manage to estimate the areas that are irrigated by percolation. Is it not rather a difficult business?—I can give you statistics which will show you the area that is irrigated by percolation at the time of the settlement because it is then recorded what area is irrigated and what is irrigable.

161. Q. It is as a matter of fact, land ascertained by inspection to be irrigated?—Yes, and it is the best irrigated land of the lot.

There was one statement by Mr. Harriott which I do not think was quite understood. When he was examined, I understood him to say that cultivators only paid water rate to the owners of private tanks in years when they took water. That I think is not correct. As far as I have ascertained from cultivators they pay water rate every year whether they take water or not, except in years when water is not available.

Mr. Rajaratna Mudaliar.—Government spent large sums of money in this province in the last famine in repairing many private tanks?—Yes.

162. Q. Can you say what amount was spent and how many tanks were thus repaired?—I am afraid I cannot tell you. The Commissioner of Chhattisgarh has collected that information for you. He has got special statistics to show what areas are actually irrigated by works constructed by Government.

163. Q. Is there any intention of recovering the whole or a portion of that money from malguzars?—I believe not. In the last famine the whole of the expenditure was incurred by Government. It was not advanced as a loan by Government, but spent by Government on relief works of which the malguzar was the manager.

164. Q. You stated in reply to Mr. Higham that legislation would be necessary to enable you to charge a water rate on lands commanded by new irrigation works whether water was taken or not?—Yes.

165. Q. Don't you think that the difficulty could be got over by classifying the land as wet in your settlement and assessing water advantage rate?—One objection from the Government's point of view is that the revenue would never be realised except upon a revision of settlement and therefore if the Government made irrigation works during the currency of a settlement it would get no return until that settlement has expired.

166. Q. Could not that difficulty be got over if at the original settlement you declare in the notification that the classification of the land would be altered during the currency of the settlement if the Government spent money on constructing irrigation works?—That might perhaps be possible. But I am not quite sure whether it will be legal under the present law. It will be a very cumbersome way of doing it.

167. Q. Is it not an easy way of getting over the difficulty about legislation?—It is open to the strongest objection in that half the increase goes to the landlord who has not spent anything.

Mr. Rajaratna Mudaliar.—In the Periyar tracts the Government reserved such a power and if the same course be followed in this province we might avoid the necessity for legislation.

Mr. Higham.—They do not reserve it in this province.

Mr. Muir-Mackenzie.—They might reserve it in the next settlement.

Mr. Rajaratna Mudaliar.—During the currency of the settlement?

Mr. Muir-Mackenzie.—You cannot issue a notification during the currency of a settlement. We follow the same practice in Bombay. At the time of settlement we notify that the assessment is not liable to enhancement during the period of settlement, except if the Government were to introduce improvements. You cannot do that under the existing law in this province?—I do not think so, and in any case the malguzar would, under such a system, get half the increased rental, whereas Government ought to get the whole.

Mr. Rajaratna Mudaliar.—You object to the permanent exemption from enhancement of assessment on account of private improvements?—Yes.

168. Q. Seeing that the Government does not spend any money on such improvements, on what ground do you object to such exemption?—My ground is that all improvements of that nature are based upon the advantages of the soil and therefore the Government is entitled to a share in the profits of those advantages. If a land is irrigable from a well the owner is not entitled to the whole exemption simply because he has built a well. The Government is entitled to some share of the profits because it was found possible to build a well on that land.

169. Q. (Mr. Muir-Mackenzie.)—You mean that land with water within easy reach is more valuable than land with water at a greater depth?—Yes.

170. Q. (Mr. Rajaratna Mudaliar.)—But the Government would not reap any advantage unless the ryot built the well. He pays his own money and reaps advantages with the aid of irrigation which the Government has not provided?—The Government provides him with the land and provides him with water at a particular depth.

171. Q. Does the Government spend any money in providing water?—No.

172. Q. That is the reason for permanently exempting from enhancement all assessment on improvements. In 1854 this exemption was granted. Since then there has been an enormous increase in the number of wells in the Madras Presidency. The people understand and appreciate it because the land is classed as dry. There is a misapprehension in Bombay but not in Madras. You refer in paragraph 13 to the system of remission of one-eighth jama. How would it remove the misapprehension? On the total holding there would still be an enhancement?—The misapprehension would be removed like this. In the first place you would remit one-eighth of his revenue straight away. You give him a reduction to start with. Supposing a malguzar has a village which pays a revenue of Rs. 100, you remit one-eighth of that at once, and you say to him, "Your jama will not be enhanced for a period varying with the amount of money spent." If he spent Rs. 500 the period might be 10 years, and if he spent Rs. 1,000 it might be 20 years. He will have an exemption of one-eighth of the full assessment for all time.

173. Q. You would not give it to him on the whole village?—No, only the area improved.

174. Q. But the assessment of the village as a whole may be enhanced?—Yes. But the area improved is made into a separate mahal, the revenue of which is not enhanced.

Mr. Muir-Mackenzie.—It is very much on a par with what is highly valued in Madras—something like an inam.

Mr. Rajaratna Mudaliar.—Under your system of assessing the entire village may not the malguzar be led to think that the enhancement on the village is so great as to swallow up the one-eighth remission?—My proposal would work as follows:—If a man has got a village and makes a tank, so much of the land as is irrigated by that tank is marked off. You give him a separate patta for that part, and give him a separate sanad saying that he holds at seven-eighths of the existing jama for so many years and on the expiry of that period, permanently at seven-eighths of the jama assessable. He thereupon becomes a tukumdar.

Mr. Craddock.—If you explain to every man the rate on each of the different soils, he would not probably understand it. But if you just mark out a portion and calculate a separate assessment on it he will understand it.

Mr. Rajaratna Mudaliar.—He will get one-eighth remission.

The President.—That might be doubled or trebled in value in course of time.

Mr. Rajaratna Mudaliar.—At the next revision what will you do?—He will hold at seven-eighths of the jama existing at the time when the improvement was made for his fixed period of years, irrespective of the fact whether a revision intervenes in that fixed period or not. Suppose the area is assessed at Rs. 100 before the improvement is made. On making the improvement, the holder will be allowed to hold at Rs. 87-8-0 for his fixed period of years, say 25 years. During this fixed period, a revision settlement may be made in the district, say after 15 years, in which the jama assessable may be raised from Rs. 100 to 150. For the remaining 10 years of his fixed period, he would still hold at Rs. 87-8-0 and at the end of that period he would hold at seven-eighths of Rs. 150.

175. Q. But the enhancement at a subsequent revision on this particular plot might be so high as to

swallow up the remission?—The remission can never be swallowed up, because, but for the remission, the enhancement would be still higher.

176. Q. That is a doubtful point. The whole difficulty will disappear if, as Mr. Muir-Mackenzie stated, you grant permanent exemption for improvements.

Mr. Craddock.—At any rate you must insure to Government some portion of the increase.

Mr. Rajaratna Mudaliar.—The increase due to high prices will be secured to Government.

Mr. Craddock.—You should get something out of the water advantage as well.

Mr. Rajaratna Mudaliar.—Is it worth while claiming it, considering the advantages that you otherwise derive?

Mr. Craddock.—It may be several lakhs of rupees.

Mr. Rajaratna Mudaliar.—Considering the number of wells and tanks that you have, can you not afford to forego the amount?—You will have a great deal of opportunity of hearing what the native witnesses say, and I am inclined to think they will consider my scheme a greater stimulus to improvements than permanent exemption of the improvement.

177. Q. Mr. Chitnavis said that he advocated permanent exemption?—You ask ordinary men which they would have—permanent exemption of improvements or tukum grants. You will find that the majority will plump for the tukum grant.

178. Q. There is something very tempting in the offer of making them muafidars. But when they find that at the end of the next settlement the enhancement has been very great, they will turn round and say "All this was a blind."

Mr. Craddock.—They do not look so far as that. They leave all to chance.

Mr. Rajaratna Mudaliar.—In page 7 of your Appendix the number of tanks shown against 1894-95 in Seoni is 2,411, whereas the number in the preceding and succeeding years is only 500 and odd?—I have verified the figure and it is correct. The difference is probably due to the fact that in 1894-1895 every petty pond was returned as a tank.

179. Q. On page 11 the area irrigated under wells in Balaghat Khalsa in 1892-93 is shown as 13,085; but for the preceding and succeeding years the figures respectively are 3,211 and 2,228. The number of wells does not show a large variation?—I have verified the figure, which agrees with the returns, but I cannot explain the difference.

180. Q. In the same way in the Bhandara Khalsa, the area under wells in the year 1899-1900 was 1,977, whereas in the next year it rose to 2,300 although the number of temporary wells shows a decrease from 1,334 to 463?—In the year 1899-1900 there was famine, when all the wells ran dry and the amount of the area irrigated was extremely small owing to the limited supply of water; but the year 1901 was fairly good and the wells commanded a good area.

181. Q. In the year preceding 1899-1900 temporary wells were over 1,000, whereas it fell to 463 in 1900-1901. Is there any mistake?—On verifying the figures I find that, through error, the number of wells was returned as 463 instead of 1,463. The latter figure is correct.

182. Q. On page 13 in regard to Bilaspur Khalsa against 1896-97 there is an enormous jump under "other sources," the area irrigated being 30,871 as against 1,576 in the preceding year?—I have verified the figure, which is correct according to the returns. In that year of short rainfall, the cultivators resorted very freely to streams for obtaining irrigation water.

183. Q. On page 7 of your note in paragraph 19, you use the term "net cropped area." What does that term mean? Is it exclusive of the second crop?—The net cropped area is the actual area under crop, irrespective of the fact whether it was cropped once or twice.

184. Q. In giving exemption which you propose to do by muafi would you take a money limit or an acreage limit?—I would take both limits.

185. Q. Would it be possible to estimate the outlay? Would it not be safer to take the acreage limit, the probable area that might be irrigated, instead of the outlay?—Under our present system we take both the limits without any difficulty.

186. Q. How would it be possible to fix the outlay?—We do it by local enquiry at the time of the settlement.

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Mr. F. G. Sly. 187. Q. A proprietor may say that he spent Rs. 10,000 while he actually spent only Rs. 2,000?—The bund is there and the tank is there. Anybody can measure up the earth work and see what the amount of the earthwork is.

188. Q. Is it not sufficient to take the capacity of a work and the area irrigated and then grant the exemptions?—I think not. In that case if a man has got an extremely favourable work in which his outlay per irrigated acre is very small indeed, he would not come under the exemption rule although he may be well entitled to it. If you limit large works to the sum spent per acre, which is, I understand, what you suggest, it may be that a man has a favourable site in which he could make a tank at a cost of Rs. 500, and irrigate a large area; he would not come within the limit of exemption. But if he had a more difficult work which had cost him Rs. 1,000 you would then let him in.

189. Q. I did not mean that. I put it to you, if a man spent a sum of money and irrigated 20 acres in a more favourable place, and another man who spent twice the sum was only able to irrigate half that area in some other locality, the second man would be in a less favourable position than the last man?—What I propose to do is to draw a distinction between larger works and smaller works. I cannot draw that distinction on the cost per acre. If I do that, I may exclude a man who may have spent a large sum upon a work which irrigates a small area.

190. Q. How would you distinguish them?—You have the capital outlay of the tank, say, Rs. 1,000. Exemption will not extend over an area upon which less than, say, Rs. 10 per acre has been spent. If he spends Rs. 1,000 to irrigate 100 acres of land, he will get it all free under the exemption rules. But if he

irrigates 150 acres of land, he will only get exemption for 100 acres.

191. Q. Suppose he irrigates 50 acres?—He will get exemption for those 50 acres only. That is, he will get exemption for the actual area benefited by the tank, provided it does not exceed the maximum limit.

192. Q. Your money limit must be very arbitrary?—It is an arbitrary limit. You cannot have anything but an arbitrary limit. I suggest Rs. 12 an acre.

193. Q. What is the objection to granting exemption to the whole area irrigated?—Because it may be unreasonable. By throwing a bund at a cost of Rs. 20 across the stream a man might be able to irrigate 100 acres. For making that small bund it is not necessary that the Government should give up its revenue on those 100 acres of land. It is unreasonable to expect Government to do it.

194. Q. Suppose you were given a large sum of money to distribute in the way of loans for the construction of wells, would you spend it on the construction of wells in wet lands rather than on dry lands? Suppose you had a lakh of rupees to advance for the construction of wells, would you prefer to advance the money to persons who wish to sink wells in wet lands under tanks, or to persons who wish to sink wells on dry land?—I would prefer to sink wells on dry lands.

195. Q. On what ground?—Because the wet land at the present time is at least partially protected.

196. Q. Where it is not fully protected, would it not be better to spend the money on the construction of wells in such areas so that they may be fully protected by enabling the cultivator to give one or more waterings and thus protect the crops which might otherwise be lost?—I think I would prefer to spend it on the worst protected dry crop lands.

WITNESS No. 6.—MR. SAKHA RAM, Patel, Nawegaon.

Mr. Sakha Ram. To Mr. Craddock.—My ancestors made the Nawegaon tank in Bhandara two or three hundred years ago. It gives water to five villages of which it irrigated nearly the whole area in 1899. All this used to be waste land. We got no *tukum*. The people of the

five villages repair the tank. I give water free for rice but charge one rupee per acre sugarcane. We used to charge 3 rupees before. The tank has never dried. The people help in distributing the water.

WITNESS No. 7.—MR. SUKH LAL, Patel, Mulguzar of Balaghat.

Mr. Sukh Lal. To Mr. Craddock.—I am Patel of three villages in Balaghat. Irrigation is badly required in the Katangi tract of Balaghat, where the crops generally suffer from deficient rainfall. Government has now to spend

so much on famines, remissions, etc., that it would pay them to give the water for nothing. I would, however, be willing to pay 8 to 12 annas per acre for water in a year of drought.

WITNESS No. 8.—MR. GUZUFFAR HUSAIN, Malguzar of Baisa.

Mr. Guzuffar Husain. I am Malguzar of Baisa in Nagawpur. Rice, juar, and cotton are the chief crops grown in my part. There are no *bandharas* in my villages. It is not the custom to make them; they can only be made in flat land. If I had funds for irrigation I would irrigate my rice lands, and not my wheat lands as the latter suffer from rust if they are irrigated and the year is wet. Cotton does not need irrigation. We will not change cotton and juar for wheat and rice. Irrigation increases the yield of rice from 25 to 50 per cent. in normal years and from 60 to 100 per cent. over a series of dry years. The people will pay 12 annas to Re 1-8

per acre for water to begin with. They may pay more when they get accustomed to irrigation, and where they can grow a double crop they will pay Rs. 2 per acre. I would only pay in a dry year for water to fill my tank from a Government tank. The *tukum* system will not lead to any extension of irrigation unless the people are given *takavi*. This should be given at 5 per cent. interest to be repaid in 15 years. This is long enough. Any longer period would retard further improvements until the debt was cleared. I have seen the wheat irrigation at the experimental farm. In dry years wheat benefits by irrigation.

FIFTY-THIRD DAY.

Nagpur, 6th March 1902.

WITNESS No. 9.—MR. MUHAMMAD-UL-HUSAN, B.A., Assistant Settlement Officer, Chanda.

Replies to printed questions.

A.—GENERAL.

Mr. Muhammad-ul-Husan. Q. 1. The following answers refer to the Chanda district, where I have been working since 1897 as an Assistant Settlement Officer, and have in that capacity worked in the tahsils of Warora, Brahmapuri, and Chanda. During the last famine the greater part of the Brahmapuri tahsil, which is a true rice tract, was in my charge.

Q. 3. (1) No, except in jungle and outlying villages. (2), (3), and (4) No.

(5) The recent adverse experiences have made the cultivator a little over-cautious; but the change is only a temporary one, and will soon pass away if not strengthened by another similar experience.

(6) No.

(7) Yes.

(8) No.

Q. 4. Improvements are exempted from assessment for the remaining term (if any) of the current settlement, plus the term of the settlement next following their construction. During the former term the exemption is automatic, while during the latter they are allowed to go unassessed, the profits arising from them being disregarded at the settlement.

These concessions are equally applicable to the improvements made by tenants (*vide* Revenue Manual, Volume II, Section I, Circular 13, and also Tenancy Act, Section 79.)

These concessions are, however, not sufficiently liberal, or have at least lost this character on account of the change of conditions. I would suggest that the profits due to an improvement made by private enterprise be exempted from assessment *in perpetuity*. (For reasons see reply to Answer No. 32.)

Q. 5. No. To make an improvement under the existing provisions of the Land Improvement Loans Act is not a profitable business, while it is attended with various sorts of liabilities, inconveniences, hardships, and risk.

I would suggest—

- (1) That the loans be issued without interest.
- (2) That the period of the exemption or improvements thus made should never be shorter than the period fixed for the repayment of the loan—and that the minimum term of exemption be 25 years.
- (3) That the profits due to such improvements be assessed at $\frac{1}{4}$ th of the kamil-jama on the expiry of the term of exemption.
- (4) That the cases of the failure of the works be duly considered and disposed of according to the circumstances of each case.

Q. 6. No. People of Chanda district realise full well the advantages of good irrigation, and wish to see their crops protected; but I have not seen any manifestation of strong desire on their part.

D.—TANKS.

Q. 23. (1) No special arrangements are made in this district for supplying the tanks with water. They depend exclusively upon the rainfall on their catchment area, which is usually a sloping plain, and sometimes the slopes of hills—a few of the large tanks have nallahs as their feeders.

(2) Large tanks are furnished with *toorums*, small tanks with wooden tunnels, while in *boris* the dam is cut through yearly. On reaching the outside of the dam the water is conducted to the fields by open channels.

- (3) (a) i. In large tanks throughout the year.
- ii. In small tanks up to December.
- iii. In *boris* during the rains only.
- (b) i. In large tanks throughout the year; but during the hot weather the supply is greatly diminished.
- ii. In small tanks up to the end of October; but side channels cease to work with the rains.
- iii. In *boris* up to the cessation of the rains.
- (c) i. In large tanks up to December. I mean those tanks only which are fed by nallahs. Others get no supply.

Q. 24. (1) No second crop follows rice except lakhori, which is a minor crop and is confined to black soils, which are rare in rice tracts. Where it is sown it may add Rs. 4 to the value of the produce of rice.

- (2) i. Rice may be substituted for *juari*; or
- ii. Sugarcane may be substituted for *juari*;
- iii. Sugarcane may be substituted for rice.

In the first case the difference between the values of the produces of the crops concerned will be Rs. 14-8-0 per acre—in the second case Rs. 239-8-0 per acre—and in the third case Rs. 225 per acre.

(3) The following ratios refer to the yields of transplanted, but unirrigated rice; and transplanted and irrigated rice, respectively:—

- (a) as 8 : 10
- (b) „ 3 : 10
- (c) „ 0 : 10

Q. 25. Too late commencement of irrigation (that is in the beginning of July) does but only reduce the outturn by a proportion varying from annas 4 to annas 8 in the rupee; but the too early cessation of it does totally destroy the heavy rice and seriously injures the light species. By too early cessation of irrigation, I mean its cessation in the beginning of September. It may be noted here that heavy rice covers 75 per cent. of the rice area in this district.

Q. 26. No.

Q. 28. (1) Water-rate is not levied here separately. It is always included in the rent of land. But the difference, between the rent of one acre under the unirrigated rice, and that under the irrigated rice, must represent the water-rate which, according to this comparison, falls at Re. 1 per acre of the irrigable area.

In two villages of the Brahmapuri villages some area is irrigated from the tanks of other villages, and the average water-rate levied in these cases by the owners of the tanks concerned falls at Re 1-10-7 per acre. This rate is paid on the irrigable area, whether actually irrigated or not. The total area to which the above-mentioned rate refers is small; but the contract is permanent and of long standing.

Sugarcane.—Rupees 6 per acre of the actually irrigated area.

(2) Varies from Rs. 2 to Rs. 3 per acre of irrigable area including the rent of land.

(3) Half the rent paid by the tenants.

Q. 29. The expenditure required for bringing the water to the field is quite insignificant.

Preparing of an *already reclaimed and cleared* land for irrigation costs from Rs. 2 to Rs. 3 per acre. The cost is incurred by the tenant. (For security, see Tenancy Act, Section 32.)

Q. 30. According to the provisions laid down in the *Wajib-ul-arz*, the owner of the tank is responsible for its maintenance.

Annual cost of maintenance Re. 0-4-0 per acre of the irrigable area.

There is a general tendency among the owners of the tanks, to shake off the responsibility of maintaining the tanks, many of which are consequently in bad condition. I would suggest that the condition of *Wajib-ul-arz* referred to be enforced under Section 123 of the Land Revenue Act.

Q. 31. Plots nearest the tank get water first, then the next ones, and so on.

Q. 32. There is still a vast field for the extension of irrigation in this district. But while, on the one hand, in a district like Chanda [where the natural features of the country happen to be such as to render it impossible or at least impracticable (with reference to cost, &c.) to construct large irrigation works like canals which may command the whole rice tract] it is not only a matter of advisability, but also a matter of necessity to encourage and assist the construction of further tanks by private enterprise; on the other hand, the present tendencies and policies of the well-to-do proprietors of land, who are mostly non-agriculturists, have rendered it a matter of grave doubt, whether with all the possible improvement of the existing provisions, regarding the exemption of improvements from assessment, it would be possible to induce them to spend money on the construction of tanks. The fact is that the improvement of land, taken as a speculation, has a very strong rival to compete with—I mean the money-lending business which returns large profits and at the same time is quite suitable to the habits and manners of the people of these parts. The ordinary rate of interest is what they call *sanai*, followed by compound *sawai*. The actual recoveries might not be amounting to that much; but allowing a fair margin for all sorts of losses, they never fall short of an amount in the long run which represents a *simple* interest of 20 per cent. per annum, while 12 per cent. per annum is the highest rate of interest which a land improvement, if free from assessment, can return to a non-agriculturist landlord. Hence it is that the money-lending business has monopolised the entire attention and capital of the rich landlords. Construction of improvements of a costly character has already become a thing of the past. *Boris* of small size are still made by cultivators when found indispensably necessary. But I fear they are also destined to meet the fate of the larger works, because the mania of money-lending has begun to infect the tenantry as well. I have seen but very few such tenants as possess 15 or 16 bullocks and do not lend money or grain to some extent.

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It is with reference to these circumstances that the measures mentioned in Answers Nos. 4 and 5 have been recommended, radical though they appear to be; but nothing short of such concessions can be expected to

induce the rich land-owners to undertake the construction of improvements. The case of non-agriculturist proprietors will still remain doubtful; but the agriculturists will readily respond to the concessions.

1. Q. (The President.)—You have been in the Chanda district for four years?—Yes.

2. Q. You were there through the famine?—Yes.

3. Q. Did you suffer very much?—Yes.

4. Q. Did you know that district before you went there in 1897?—No.

5. Q. You are employed in the Settlement Department?—Yes.

6. Q. I understand there is a great deal of rice cultivation in Chanda?—Yes. The whole of the Bramhapuri tahsil excepting a small part of it in the north which adjoins Bhandara. It is along the boundary of the Bhandara district which is called Chauras.

7. Q. There are many tanks?—Yes, many tanks of various sizes.

8. Q. What happened during the famine time? Did these tanks hold on or dry up?—All dried up except one or two. The tank of Rajoli is a big lake situated in a hollow between two hills. In that village there was a twelve-anna crop. That was a normal crop of rice in that year.

9. Q. Is it a large village?—Yes. There is another village, Govindapur, where there is also a big tank. The area sown there was not wholly rice land. Only one-fourth of it was rice land, and the yield was 7 annas.

10. Q. In these villages did people go to relief works?—Yes, they went.

11. Q. They were not so protected as to be independent of relief works?—No.

12. Q. Even where there was irrigation?—Yes.

Mr. Craddock.—Did you understand the President's question? He wants to know if the people of Govindapur and Rajoli went to relief works?—Rajoli was not in my charge, and the people of Govindapur went.

Mr. Muir-Mackenzie.—Irrigation did not help them?—No. Out of 500 acres rice was sown only on 100 acres; but that did not give sufficient labour. The tenants that reaped crops did not go; but the labourers and poorer tenants, who had no crops, went.

The President.—I suppose there is a good deal of irrigation in the Wainganga merely from rainfall—irrigation in rice cultivation?—Yes.

13. Q. These crops entirely perished, I suppose?—Yes.

14. Q. Are any of the tanks connected with any rivers like the Wainganga?—No.

15. Q. You do not know whether it has been done anywhere or any channels taken from rivers to fill tanks?—One or two tanks have nallas as feeders.

16. Q. I suppose that in times of famine they would be all right?—Govindapur tank has a nalla, and Rajoli tank has also a nalla.

17. Q. Coming from the rivers?—No, from the hills.

18. Q. Is there scope for many more tanks in Chanda?—Yes.

19. Q. Do you think that if the Government were to make large reservoirs enough for 20 or 30 villages, they would be popular with the people and they would like them?—They would like them and utilise them to their full capacity.

20. Q. They are certain to take water?—They will take it.

21. Q. Do you know anything of what has been proposed by the Public Works Department as regards the tanks and their places?—I do not know. I have proposed 3 or 4 projects and those places I know.

22. Q. Is there any well irrigation to speak of?—Very little. They irrigate vegetable crops from wells dug in the bed of a nalla or in the bank of a nalla.

23. Q. Any big wells?—No, all *kacha* wells.

24. Q. Do all tanks have sluices or do they percolate through bunds?—There is no such thing as percolation.

25. Q. There is in Chhattisgarh?—No. In a few larger tanks you have got *toorums* or sluices—masonry sluices, and fairly large tanks have wooden tunnels under the embankment. In regard to smaller tanks the middle of the tanks is cut every year and water flows through it. That is called *mookand*, which means main channel.

26. Q. Do tanks have enough of water for second crop?—Yes, for sugarcane.

27. Q. Is there much sugarcane grown under them?—As far as possible with reference to water-supply.

28. Q. Are they in the habit of making wells to save sugarcane if the tank fails? We find that practice in some other parts of India?—Sugarcane crop is irrigated in Chanda in two ways. One way is to irrigate it from tanks, and the second way is to irrigate it from wells.

29. Q. We found in some other places there were wells under tanks and they were not used until the tanks became dry?—I do not see such things here.

30. Q. Is the number of wells increasing in the district?—It is almost stationary. In some years it is shown as much less.

Mr. Craddock.—You may have seen wells under construction?—I don't think the number of *kacha* wells is increasing. Those that become useless are left as they are and new ones are dug.

The President.—You say in reply to Question 4 that there is not much demand for *takavi* advances. You say that the concessions are not sufficiently liberal and then you go on to suggest, in reply to Question 5, "that the loans be issued without interest; (2) that the period of the exemption of improvements thus made should never be shorter than the period fixed for the repayment of the loan, and that the minimum term of exemption be 25 years; (3) that the profits due to such improvements be assessed at $\frac{1}{4}$ of the *kamil-jama* on the expiry of the term of exemption; (4) that the cases of the failure of the works be duly considered and disposed of according to the circumstances of each case." Is not the failure of works duly considered and disposed of according to the circumstances of each?—I never saw such a case. I only put it down there.

Mr. Muir-Mackenzie.—You have not had much to do in the giving out of *takavi* on account of improvement of lands?—No.

31. Q. Attractions are enough for people who go in for loans for seeds?—Yes.

32. Q. The terms on which *takavi* is granted for seeds are the same as those for loans for land improvements?—Yes.

33. Q. Then why are they not sufficient in the case of loans for land improvements?—The amount they require for seeds is generally very small, whereas the amount required for land improvement is very large.

34. Q. Still the terms are equally liberal?—Yes.

35. Q. Is it not more likely that they are not willing to incur heavy liability, judging from the fact that they are willing to borrow small sums and not large sums?—Small sums they take and repay anyhow.

The President.—Some men borrow a good deal from the sowcar, do they not, for other purposes?—For the purpose of improvement you mean?

36. Q. Yes. And they are accustomed to pay a heavy rate of interest?—Yes.

37. Q. Government asks what interest?—6 per cent.

38. Q. That is not heavy?—No. They take loans for their necessities.

39. Q. From the sowcar?—Yes, for seed and other expenses. But I do not think they will go to the sowcar for loans for improvements.

40. Q. Was there a great loss of life in Chanda during the famine?—Yes, when the cholera broke out.

41. Q. Died from starvation, I mean?—I do not think so.

42. Q. Was there a great loss of cattle?—There was.

43. Q. Now if the famine were to come again would they be better prepared to meet it than they were before?—I do not think so.

44. Q. What would you recommend Government to do to make them better prepared?—To make them more prosperous. There is no other way.

45. Q. How could you make them more prosperous?—Only if it is possible. The Government cannot prevent droughts.

46. Q. What would you do to make them more prosperous? The Government made railways and did a good many other things. What else do you think we should do to increase the prosperity of places?—Construction of protective works.

47. Q. Do you mean irrigation works?—Yes. In rice country the construction of irrigation works is protective and will add much to the prosperity of the people.

48. Q. Do you see yourself that it is not difficult to make irrigation tanks, but it is not very easy to arrange that they shall hold water at a time when it is most wanted. You say that very few hold water?—Yes.

49. Q. You say in reply to question 30 on page 3, "There is a general tendency among the owners of the tanks to shake off the responsibility of maintaining the tanks, many of which are consequently in bad condition. I would suggest that the condition of the *Wajib-ul-arz* referred to be enforced under Section 123 of the Land Revenue Act." I am not aware of that section. What is that section?—It is that *malguzars* are responsible for keeping their tanks in good repair.

50. Q. Can they be punished if they do not do it?—No punishment under that section. If the Government enforces the provision, then in case of its violation a *malguzar* will be liable to punishment.

51. Q. Does the Deputy Commissioner give orders? What is the procedure adopted? If the Deputy Commissioner hears that a tank is in bad repair and the *malguzar* does not repair it, does he issue orders to warn the man?—Nothing of the sort at present.

52. Q. You say there are a number of tanks in bad repair?—Yes.

Mr. Craddock.—Any number of absentee landlords—that is the difficulty?—Yes. This is also one of the chief causes for the decline of sugarcane cultivation.

The President.—Due to bad repairs?—Yes. In a part of *Brahmapuri tahsil* there is sugarcane cultivation and I have not seen any village where the area of the sugarcane was less than what could be irrigated from the tank. There was sugarcane in *Gurbhodi pargana*. Sugarcane was raised to the full capacity of the tanks.

53. Q. Is it a valuable kind of sugarcane that is grown?—Yes. It is of the *kala* sort.

54. Q. It has a good market, I suppose?—Yes.

55. Q. You think it is getting less?—Yes.

Mr. Muir-Mackenzie.—The reason of it is the capacity of the tank is diminishing.

The President.—The diminution of the capacity of the tank is due to want of repairs?—Yes.

56. Q. Not owing to dry years?—No. Dry years must occur every now and then. Another thing about sugarcane is that while all crops depend on the monsoon of one season, sugarcane has two successive seasons to depend upon. Sugarcane is sown in January of one year and cut in January of next year. When it is sown, the preceding monsoon has to be considered. Then after the next monsoon it has still to be irrigated for 3 months. It is more risky than other crops. It depends upon two successive monsoons.
10 *kandies*.

57. Q. Then I suppose the return is very large and very profitable?—Yes. I just made three experiments in sugarcane. In one case the outturn of *gur* was eight *kandies* per acre, that is 4,000 lbs. In Warora I made two crop experiments. In the one case the yield was 10 *kandies* and in the other little more than 10 *kandies*.

58. Q. How are these irrigated—by tanks?—In Warora irrigation is from perennial springs. But in the other villages it is from tanks.

59. Q. We were told yesterday that sugarcane has become less because of the railway?—That may be one cause, but the chief cause is the diminution of the capacity of tanks. I did not see anywhere a case that where there was water in the tank there was so sugarcane. But people have not sufficient water-supply to extend irrigation for this crop.

60. Q. Are you a native of this province?—No, I am a native of Agra.

61. Q. Do you think that people take less care of their tanks than they used to do? Are they getting more careless?—I do not think so. Even if they are equally careful the tank must be in a worse condition than before.

62. Q. In reply to question 32 on page 3 you say that "the fact is that the improvement of the land, taken as a speculation, has a very strong rival to compete with the money-lending business." Does the ordinary peasant cultivator go in for money-lending?—The ordinary peasant cannot make any improvements.

63. Q. I thought he went in more for borrowing than for lending?—Those ryots who are in a substantial condition lend money.

64. Q. One cultivator lends money to another?—Yes, that is very common.

Mr. Rajaratna Mudaliar.—It is common in Madras too.

Mr. Muir-Mackenzie.—What is the percentage of money-lending business done by ryots?

Mr. Rajaratna Mudaliar.—About 80.

Witness.—When a cultivator can save Rs. 20 or Rs. 30, the first idea that occurs to him is to lend it to another.

The President.—I thought that the Marwari was so clever that he left very little chance to anybody else?

Mr. Rajaratna Mudaliar.—Richer ryots make more than what Marwaris do by lending it in grain and making it payable fourfold.

Witness.—When money-lending is combined with trade, as they usually do, it is very profitable.

Mr. Muir-Mackenzie.—What do you think makes the owners of tanks neglect their repairs? Is it not to their interest to keep them in good repair? Would not their rents fall off if they neglect them?—No. When the capacity of a tank is diminishing gradually, the tenants continue paying their rents.

65. Q. Have not they power under the law to apply for a reduction of rent?—No. They do not know these things.

66. Q. You are settling this district?—Yes.

67. Q. Have you found in the course of your settlement that the capacity of a tank is considerably reduced?—Yes. I have seen it.

68. Q. Have you not recorded reduced rent?—We have recorded in our inspection notes the diminution of the capacity.

69. Q. Have you not reduced the rent?—We have not come to that. I have noted that the irrigation is poorer now than before.

70. Q. When you come to the fixation of rent would you not reduce the rent?—I think so.

Mr. Craddock.—You have reduced the area classed as irrigable?—Yes.

Mr. Muir-Mackenzie.—That will result in the reduction of rent?—Yes.

71. Q. Seeing that the rent of the landlord is liable to a reduction of that sort, does he not understand that it is to his interest to keep the tank in repair?—No, because his income is not reduced.

72. Q. But in order to guard against a reduction of income is it not to his interest to keep it in repair? Does he understand it?—He does not do it. I do not know if he understands it or not. Whether he does not realise this or he is not able to do it, I cannot say?

Mr. Craddock.—You must have spoken to some *malguzars* when you saw them neglecting their tanks?—Yes. In one case a *malguzar* replied that there would be no additional profit to him.

Mr. Muir-Mackenzie.—How is that? There will be a loss of rent. If he does not repair a tank a lower irrigable area will be fixed and the rents in consequence will go low?—In the beginning when the capacity of a tank is diminishing the effect is not perceptible. The irrigation of a higher order becomes an irrigation of a poor order. But it still remains irrigation. In years of short rainfall crops are more liable to damage than in years of sufficient rainfall.

Mr. Craddock.—You mean that the falling-off is so gradual?—Yes, so that it is not so perceptible.

The President.—Would it not be perceptible when the settlement comes?—The question is whether it is not cancelled by increase on account of other considerations.

Mr. Muir-Mackenzie.—Take the case of Government. Considering that the Government derives increased revenue from increased rent, do you think it is altogether wrong that the Government should bear some share in the repairing of these tanks?—No, I think it is quite fair.

73. Q. The Government takes 60 per cent. of the assets—does it not?—Yes.

75. Q. Don't you think that the Government ought to take 60 per cent. of the charges?—I should say "No."

76. Q. What do you think the Government ought to take? I mean to say the Government should take

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its 60 per cent. from the profits deriving from the land and not from improvements.

77. Q. You have not understood my question. As the Government takes 60 per cent. of the assets, would it not be equitable for Government to give 60 per cent. of the amount required for keeping the tank under repairs?—Landlords will have no claim to it. If it is given at all, it will be a concession.

78. Q. Don't you think it would be equitable for the Government to make it?—Yes, I think so.

79. Q. These tanks are the greatest boons to the country to meet a famine?—Yes.

80. Q. Considering that all these tanks have failed in the bad famine of 1899-1900, do you think that in multiplying their number you would increase the protection of the country?—No. Not by increasing the number of tanks, but by the construction of big tanks.

81. Q. Large storage works?—Yes.

82. Q. The multiplying of small tanks would not do? It would not increase cultivation.

83. Q. You are familiar with the facts of 1896-97 when there was a heavy rainfall in the beginning?—Yes.

84. Q. Did all the tanks hold water in that year?—Yes.

85. Q. Even for a year like that would the multiplying of tanks do any good?—We had a 12 anna crop that year.

86. Q. The fact of having a 12-anna crop is due to that?—Yes, solely due to that.

87. Q. Since the multiplying of tanks will not increase the protection of the country, do you think that you would increase the protection of the country by increasing the number of wells?—No.

88. Q. Why not? Will they all fail?—Yes.

89. Q. Were they absolutely dry just like tanks?—Water sinks down very low. *Kacha* wells which were used for garden crops went dry. We had to clean the wells for the purpose of maintaining the supply of drinking water.

90. Q. By cleaning out the wells you got some more water?—Yes.

91. Q. But by cleaning out the tank any number of times, you could not get more water?—Yes.

92. Q. So that there is this advantage with regard to a well, that you can get more water by cleaning it?—We could not get more water for irrigation purposes.

93. Q. Not even by blasting or deepening?—I have no experience of wells.

94. Q. As a Settlement Officer, you see how well irrigation is going on?—Irrigation from wells is very small. It is only on the banks of *nallas* that there are a few *kacha* wells and only a few decimals of land are cultivated.

95. Q. Have you, in the course of your duties as a Settlement Officer, examined the statistics of well irrigation, considering curious how they are in this district?—I have not done it.

96. Q. You will see that in the Chanda district there were 8,428 acres irrigated from wells in the year 1893-94; but this fell down to 2,206 acres in the year 1899-1900. You did not take notice of the condition of wells in the matter of irrigation in years of famine?—No. They were too insignificant.

The President.—They are very important in some places.

Mr. Muir-Mackenzie.—Has it never struck you to enquire why people do not care for wells so much, coming as you do from Agra, where the place is full of wells?—No.

Mr. Rajaratna Mudaliar.—Is not the smallness in the number of wells due to the fact that the rainfall has ordinarily been very good and the crop was generally safe? May not that be the cause of the non-existence of wells in many parts of this province?—I do not think so.

97. Q. Until 3 or 4 years ago there was nothing like even a drought?—There have been partial droughts since 7 or 8 years.

98. Q. Not frequent?—No. Rabi crops are not irrigated here; they are always dry crops. Rice is irrigated from tanks. It is only the garden crops that people irrigate from wells. In districts where the rabi crop is irrigated, the number of wells must be great.

99. Q. Is the large number of wells in Agra due to the fact that rabi crops are irrigated?—Yes. There

the soil is not black cotton and without irrigation they cannot grow wheat.

100. Q. Your area of rabi crops is also large in this province?—Yes.

The President.—Have you had any experience of any other district in this province?—I was in Chhindwara.

Mr. Rajaratna Mudaliar.—Is the area large in that district?—Yes.

101. Q. Why don't the ryots go in for irrigation?—The soil is very good black soil.

102. Q. The rainfall is sufficient?—Yes.

103. Q. Then, as I say, owing to very good rainfall the necessity for sinking wells is not felt so much in this province as in the other province. Do you think that there are physical obstacles to the construction of wells?—I do not think so. Our rabi crops suffer owing to excessiveness of moisture.

104. Q. How long would a temporary well last?—They will have to be cleared every year.

105. Q. Merely cleared?—Yes. Sometimes they change sites. It is no well at all.

106. Q. It is a mere hole?—Yes, a hole in the bed of a *nalla*.

107. Q. It was said that owing to your system of settlement, ryots are unable to understand whether or not they are taxed on account of their improvements. The rent is fixed on the whole holding, and on the whole holding there is a general enhancement and consequently they are unable to see whether they escape taxation on account of improvements, although the law allows it?—The fact is that the ryots do not know whether they get the concession or not. Except a few persons, the generality do not know it.

108. Q. Do you think it possible to modify your system in such a way as to enable people to understand it?—No modification in the system is required. The touring officers may explain it to them.

109. Q. In working out your classification as a Settlement Officer, how do you separate the plot on which improvements have been made by the tenants from the remainder of the holdings?—We take it as it was before improvements. Suppose a piece of land devoted to minor crops under *juar* was brought under irrigated rice, we will class it as irrigated rice; but when we come to the fixation of rent, we deduct the difference between the value of *juar* and the value of irrigated rice from the value of the land, so that we get the value of the land at the time when no improvements have been made.

110. Q. Do you give a *patta* to each tenant?—Yes.

111. Q. If this is entered in the *patta*, what difficulty is there in the tenant understanding it?—No difficulty.

112. Q. Is it, as a matter of fact, entered?—They are granted *sanads* if any one applies for it.

113. Q. Apart from that, when you introduce a revision settlement, you grant a *patta* to each tenant?—Yes.

114. Q. You give the details of your calculation in regard to previous holdings?—I do not think so.

Mr. Craddock.—We give the areas and the total on which the lump rent is fixed. There may be two or three such details.

Mr. Rajaratna Mudaliar.—We give full details in Madras: could you not give those details?

Mr. Craddock.—If we give all those details, it will make confusion worse confounded.

Mr. Rajaratna Mudaliar.—We give the details by fields. You may say what the area in the past year was, the present area is, and the land brought under irrigation, and what the rent in each case was and how much was deducted on account of private improvement. Your settlement *patta* does not show these details?—It does not show these details.

115. Q. In fixing the rent on rice lands, what enhancement is made? Do you add the water-rate to it? Suppose a *malguzar* constructs a tank and a certain area is brought under irrigation which was *juar* land before. How is it entered in the settlement?—Irrigation dues and the rent of the land are included in one and we do not separate them.

116. Q. How is the irrigation due calculated—is it at so much per acre?—We don't calculate irrigation dues separately. We take the rent of one acre of irrigated land.

117. Q. Suppose it was formerly one rupee an acre for *juar* land, what would the rent be for rice?—According to the rent of irrigated area in the vicinity.

118. Q. Suppose in a particular village there was no irrigated land?—You have it in the adjoining village. We take the same factors and same rents and we treat group by group. If there was formerly no rice land in a village we can refer to similar conditions in adjoining villages.

119. Q. A malguzar who constructs a tank gets the difference between irrigated rent and *juari* rent?—Yes.

120. Q. You calculate and show it in the Settlement report?—No.

121. Q. How does he know what profits he derives?—At the time of the fixation we inform him that his land will be rated as dry land.

Mr. Craddock.—You mean you would explain to him that he had been exempted from assessment on the value of improvements?—Yes.

Mr. Rajaratna Mudaliar.—In order to encourage the construction of tanks is it not necessary for him to know this?

Mr. Craddock.—Even though a Settlement Officer explains it to him in fixing the rent, how far he would take it in, I cannot say.

Mr. Rajaratna Mudaliar.—If you showed it to him by calculations in his *patta*, would he not trust you better?

Mr. Craddock.—Personally one does explain it.

Mr. Rajaratna Mudaliar.—You suggest in answer to question 4 that the profits due to improvements made by private enterprise may be exempted permanently. How would you effect it?—As we now do with regard to temporary exemptions.

122. Q. How are the temporary exemptions done?—They are not treated as improvements.

123. Q. Your proposal practically amounts to this: that you will not treat any land as rice land which is benefited by a private tank?—We will treat it as rice land, but not as irrigated rice land.

124. Q. Your unirrigated rice land pays a higher rate than *juari* land?—Yes.

125. Q. Is there much difference between the rent of unirrigated dry land and that of irrigated dry land?—Yes.

126. Q. What is the difference per acre, roughly?—One rupee per acre.

127. Q. At the top of page 3 you say: "This rate is paid on the irrigable area whether actually irrigated or not." In the years when the tank does not hold water I suppose the assessment is remitted?—Yes.

128. Q. As regards lands which are not classed as irrigated rice in the settlement, if water is taken, is the malguzar entitled to levy any water-rate that he likes?—Yes, he can.

129. Q. There is no restriction as to the amount of water-rate?—No.

130. Q. You say in answer to Question 5, "that the profits due to such improvements be assessed at $\frac{1}{4}$ th of the *kamil-jama* on the expiry of the term of exemption." What is the present proportion?—One-half.

Mr. Craddock.—The *tukum* system is common in Chanda?—Yes.

131. Q. Don't you think that the extension of the *tukum* system would prove an encouragement for the construction of tanks?—I think it would.

132. Q. On what ground do you think it would?—On account of the exemption in perpetuity.

133. Q. But very often the *tukum* system means exemption of a fraction of a *jama*?—That represents the rent of the land.

134. Q. The fractions of the *jama* that you have to pay are about $\frac{1}{4}$ ths or $\frac{1}{5}$ ths?—These were not larger. These fractions were fixed in 1866.

135. Q. You mean in the Mahratta days?—Yes.

136. Q. What was the exemption?—The whole.

137. Q. There was quit-rent?—Yes. The rent of the land is entered in it.

138. Q. When the question of continuing these grants was considered at the settlement, they were all commuted?—Yes, in a fixed ratio.

139. Q. That is prized by the people? A man fully understands that he is let off a certain fraction of the *jama*. He appreciates the advantage of it?—Yes.

140. Q. Do you think he appreciates it sufficiently?—I think he does.

141. Q. If you said to the man, "If you make a tank here, you will be exempted from the assessment on improvement for one or two settlements, whatever the term may be, and that after that you shall pay only $\frac{1}{4}$ ths or $\frac{1}{5}$ ths of the *jama*," do you think that would be no inducement?—It would be an inducement to some extent. That provision is better than the existing one.

142. Q. Naturally if you said that you were not going to take the rent any more, that will be the greatest inducement. I would like to ask you one thing. You have had some experience of the holders of revenue from villages. Have you heard that a holder of revenue from a village made no more improvement than others?—I did not hear of any cases.

Mr. Muir-Mackenzie.—I would not prevent a man from being enticed by fractional grants into making an improvement.

Mr. Craddock.—It would involve the exemption of a permanent nature.

Mr. Muir-Mackenzie.—The exemption is given for making a certain improvement.

Mr. Craddock.—The perpetual alienation of an estate's revenue does not produce the result. The fear of enhancement of revenue is supposed to check him. But a man who has revenue from a village has no fear of enhancement, and yet he does not make improvements, even such improvements as other men make.

Mr. Muir-Mackenzie.—He has nothing to gain by it.

Mr. Craddock.—The great argument of the people who want perpetual exemption is the fear of enhancement. But we find that even such people as have no fear of enhancement do not, nevertheless, make improvements.

Mr. Rajaratna Mudaliar.—Such villages are very few.

Mr. Craddock.—There are a lot. There is one lakh of rupees alienated in this district only. Still you think that the *tukum* is a good one?—Yes.

143. Q. And that the exemption of even some fraction would be an inducement?—Yes, some inducement.

144. Q. Don't you think that the very name of *tukum* possesses some value, even if it has not much pecuniary value?—Yes, to Gonds. Those who understand the thing don't care for it. The difficulty is that the agricultural malguzars will appreciate any concession, but the non-agricultural landholders, who are chiefly capitalists, would not appreciate it.

Mr. Muhammad-ul-Husan.

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WITNESS No. 10.—MR. CHANDI

To Mr. Craddock.—I own 40 villages, in which some rice is grown and there is a little tank irrigation. I would pay twice as much for an acre of irrigable land as I would for an acre of dry land. Our tanks cost Rs. 500 to Rs. 1,000 and each irrigate 30 or 40 acres; they were all dry in the famine. We dug *kacha* wells below the tanks for rice in the famine but found them of no use. I get Rs 4 rent for rice and Rs. 10 for sugarcane land. Some of my tanks irrigate in outside villages. I take Re. 1 per acre per *fasl*. All our cane dried up in the famine; where there was a stream we put on a *mot* and kept enough alive for

PERSHAD, Malguzar of Chanda.

seed. We only sow as much cane as the water in the tank will irrigate to the area varies. The area under cane has decreased owing to decrease in supply of water and the greater cost of fuel and fencing. If Government make a big tank the people will take water and pay 8 annas to 1 rupee per acre. They pay now 2 rupees per acre rent for well-irrigated rice land and 1 rupee for dry land. Near a village they will pay more. For irrigating their dry lands they will pay 12 annas per acre as a fixed charge; or in dry years 2 rupees per acre for maturing their crops.

Mr. Chandi Pershad.

6 Mar. 02.

WITNESS No. 11.—MR. RAGHOB RATI RAM, Malguzar of Saoner.

To Mr. Craddock.—I am malguzar of three villages and hold a good deal of tenant-land. We didn't grow

rice but chiefly wheat and *juar*. We irrigate garden crops and cane from wells. Last year we irrigated

Mr. Raghoba Rati Ram.

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Raghoba
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some cotton; this is only done in very dry years. I have tried since Egyptian cotton, but the supply in my well failed. There are many wells in my part of the country, but the water level has fallen greatly; the water surface is as much as 60 feet below ground, but the depth varies very much. A well can only water half the usual area now. Last year I made some new wells.

To the President.—The cotton I irrigated flowered much better than it otherwise would have done; irrigation would only benefit cotton in a year of drought. I would not change cotton for rice even if water were available for the latter. If I had water I would grow more wheat of which we now irrigate a very small area from wells. We make embankments. (*bandharas* and *pats*) but have to use boulders for the purpose as earth won't stay. They prevent erosion and hold up moisture on the fields; in one field that I know they increased the outturn two-fold. The rent of the field was Rs. 13, the tenant gave it up and I bought it from the sowcar for Rs. 75 and embanked it. The more embankments there are the better. If *takavi*

were given freely, the number would increase, but the rate of interest might be reduced. Embankments would do good in Hoshangabad, but the people have no enterprise. *Kans* grass has spread very much since the dry year began. The people have no bullocks to plough with; they are indebted to the sowcars and can't take *takavi*. The embankments are made where the soil consists of a sticky clay. They are not made in pure friable black cotton soil. The best protective measure for Hoshangabad would be to teach the cultivators to plough up the land more than they do at present and to pay more attention to growing kharif crops.

To Mr. Muir-Mackenzie.—Delays in the giving out of *takavi* and having to go backward and forward defer people from taking *takavi*. It is not so much trouble to go to the sowcars who have branches in the villages. In my part the rich landholders invest their money in land improvements; elsewhere, because of their ignorance, they put it into other investments. Land improving is just as profitable as money-lending.

FIFTY-FOURTH DAY.

Nagpur, 7th March 1902.

WITNES No. 12.—MR. G. S. MORLEY, M. Inst. C. E., Executive Engineer.

Replies to printed questions.

A.—GENERAL.

1. Q. Answers refer to Bhandara and Balaghat.

My experience of this province is limited to a tour of 100 days during the last working season while engaged in examining parts of the districts of Balaghat and Bhandara with a view to finding sites for irrigation works.

2. Q. The details of monthly rainfall for these two districts are as follows:—

For Bhandara District.

January . . .	0.52	July . . .	16.82
February . . .	0.39	August . . .	14.41
March . . .	0.49	September . . .	8.83
April . . .	0.38	October . . .	1.80
May . . .	0.41	November . . .	0.50
June . . .	8.65	December . . .	0.27

And for Balaghat District.

January . . .	0.48	July . . .	19.30
February . . .	0.50	August . . .	18.00
March . . .	0.37	September . . .	8.27
April . . .	0.31	October . . .	1.74
May . . .	0.56	November . . .	0.40
June . . .	8.81	December . . .	0.23

3. Q. (1) I am not aware that there is any obstacle to the extension of irrigation arising from sparsity of population, (2) but I have heard of cases where there is an insufficient supply of cattle.

D.—TANKS.

23. Q. (1) The tanks in these districts are generally supplied with water either directly by one or more small *nallas* or from the off-flow of its own natural catchment.

(2) The water is distributed either by a common water-course or by direct flooding from field to field, each field being surrounded by a high *dowla*. As a rule there are no outlet arrangements. The bund is simply breached and water let off. In the few cases where masonry outlets have been constructed they are of the primitive plug-type.

(3) In ordinary years the supply holds out till about the end of January.

In a year of scanty rainfall the supply would not last nearly so long, whereas in a year of drought there is often no influx whatever.

(4) Regarding the area irrigated by tanks—this is a question of duty and the only information I can give is in connection with three *nalla* projects which are proposed in the Balaghat district. The approximate contents of all the tanks commanded by these schemes and the distribution over the irrigated areas are as follows:—

Sarhati Nalla Project—3,184 acres are irrigated be-

longing to 19 villages from 122.4 million cft. of water, giving a duty of 38,442 cft. to the acre for rice.

In the Thondia Nalla Project 3,614 acres belonging to 34 villages utilize a capacity of 64.32 million cft., giving a duty of 17,792 cft.

In the Puchera Nalla Project 3,622 acres belonging to 23 villages utilize a capacity of 211.8 million cft., giving a duty of 58,476 cft.

The average duty for the three can be arrived at as follows:—

	No. of villages.	No. of acres.	Capacity of tanks mill. c. ft.
The Sarhati Nalla Project . . .	19	3,184	122.4
The Thondia . . .	34	3,614	64.32
The Puchera . . .	23	3,622	211.80
Total . . .	76	10,420	398.52

The average duty is therefore, $\frac{10,420}{398,520,000} = 0.00002617$ — 38,246 c-ft. or $\Delta = 0.88$ including evaporation. This result tallies fairly well with information given me by the Commissioner of Nagpur, viz., that, on the average, one foot of water, in addition to the rainfall is commonly sufficient for maturing rice crops.

30. Q. Necessary repairs are carried out by the *malguzars* who are generally the owners of tanks.

Silt clearance is not carried out systematically, but it is effected to a certain extent by taking earth, required for repairs of bunds, from the bed of tanks.

The system in vogue is very unsatisfactory, as most village tanks owing to want of repairs do not nearly hold the amount of water they might do.

33. Q. The amount of silting varies very greatly. From observations made last year, it is found that many tanks have silted up to a depth of several feet. It is not known how long these tanks have been in existence, so that the rate cannot be arrived at. In one case, viz., the Gorta tank, 0.15 of silt was deposited during the last rains. While in the case of the Nadapur tank, said to have been in existence for 200 years, the maximum silting only amounts to four feet, so that apparently each tank must be taken on its own merits.

No steps are taken to remove silt except as stated before, viz., indirectly during repairs.

Since one acre of properly matured rice can maintain between three and four souls, it seems to me to be unadvisable to provide for anything in excess of this for protective irrigation works.

3. Q. You came here 14 months ago?—Yes.

4. Q. You have studied especially the conditions of the Balaghat and Bhandara districts?—Yes.

5. Q. Are these the districts that seem most suitable

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1. Q. (The President.)—You came down here specially, I understand, to prepare irrigation projects?—Yes.

2. Q. How long have you been in the Central Provinces?—From the middle of January last year.

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for irrigation projects?—I cannot say; I have had nothing to do with projects in other parts of the province.

6. Q. Why were these districts selected?—I was deputed to examine these two districts because they were the most backward of the famine-stricken parts.

7. Q. You have prepared a number of projects, I understand?—Yes.

8. Q. Are there many of them satisfactory, from an engineer point of view?—I think nearly all of them are satisfactory from an engineering point of view. Some of them would probably be expensive. But I do not think that there are engineering objections to any of them.

9. Q. As regards the most essential point, the water-supply, are they dependent upon catchment basins of some size or upon streams?—Most of them have got nallas to depend upon. A bund across a nalla, sometimes two nallas, will fill the tanks.

10. Q. Do these nallas run pretty steadily through the monsoon?—Some of them do and some of them do not. I have had nalla gauges put up during the last monsoon and kept gauge-writers throughout the season. I have had a record put up with each project so as to compare it with the record at the stations on which the project depends.

11. Q. I see that you allow a duty of about 38,000 cubic feet to the acre for rice. On what is that duty based?—I examined two different tracts and roughly cubed up the contents of all the tanks, and I found that the average worked up to 38,000 cubic feet per acre irrigated, and that agrees closely with what Mr. Craddock told me. In addition to the rainfall they generally want one watering at the end of September and another at the end of October.

12. Q. You find that the system that is in vogue of repairing tanks is very unsatisfactory, and that the repairs are not well looked after?—They are badly looked after.

13. Q. You cannot trust to the cultivators' enlightened self-interest to keep them in repair?—I do not think so.

14. Q. I do not quite understand your last paragraph: "Since one acre of properly matured rice can maintain between three or four souls, it seems to me to be unadvisable to provide for anything in excess of this for protective irrigation works." I do not quite follow your argument?—That is from an economical point of view. If the Government were going to limit the province to a certain sum, then I thought that for the relief of famine we should not allow more than what is necessary for maintaining the population. One acre of rice can maintain between three and four souls, that is allowing $\frac{1}{4}$ a seer of rice each for men, women, and children altogether. I worked it out with the Deputy Commissioner of Balaghat and the Tahsildars of Tirora and Balaghat.

15. Q. You took the district and not the province? I took local experience.

16. Q. (Mr. Muir-Mackenzie).—You mean that if secure irrigation were given to 25 per cent. of the area you would consider protection complete?—Yes, without anything to help it.

17. Q. (The President).—Of all the projects which you have prepared, which is the one that you would put in the first place? We may think it right to recommend the Government of India to go on with one or two projects at once, merely as an experimental measure. Which projects would you recommend out of those you have prepared?—There are 3 or 4 good ones. The Khairbuntha project, in the extreme east of the Bhandara range, is the cheapest.

18. Q. What are its general features?—There is nothing that is special about it, except the difficulty in finding a site for the waste-weir, but it has been managed.

19. Q. What is the area to be irrigated?—It will protect 4,500 acres. That is allowing for waterings of 6 inches. I based all my calculation on that depth of watering. All my projects are worked out on the principle that two feet of water will protect the area mentioned in the report, provided the capacity of the tank is made 25 per cent. in excess of the mean monsoon capacity; the excess I allow varies between 17 and 27 per cent. I have tested several of these tanks for a series of years, and I find that provided the tank is made 20 to 25 per cent. above the mean monsoon capacity, you may take 2 feet, after allowing for evaporation, to carry you through, and to protect the whole area in years of drought.

20. Q. (The President).—What does the estimate of the project come to?—Rs. 1,69,000.

21. Q. It protects 4,500 acres?—4,504. It cost Rs. 241 per million cubic feet.

22. Q. That is about Rs. 40 an acre?—The average cost per acre is Rs. 35.

23. Q. That is extremely cheap?—There are one or two other projects which are just as good as this, but they do not work out so cheaply. The Chandpur project will protect 8,586 acres and costs Rs. 265 per million cubic feet. I have allowed for a masonry dam, but it might be possible to put an earthen dam. The only difficulty is what to do with the waste water during construction. The Ponnara is another very good project, but wants working out more fully.

24. Q. You have had no time to complete it?—Yes, I have had no time. These projects have had to be rushed through.

25. Q. You have had nothing to do with Ramtek project?—When I first came here the scheme was sent to me and I made my notes. I was not asked officially about it.

26. Q. What projects have you in the Balaghat district?—I have got a few small tank projects and two nalla schemes.

27. Q. You say it is a district that suffered heavily?—Yes, specially on the Katangi side. It has been lately proposed to deal with it in another way. If we work the Mandalay system we can get over the difficulty of the gorges, which are very steep.

28. Q. What is the Mandalay system?—It is a system of running an embankment parallel to a line of hills where you cannot make ordinary tanks; and of forming a series of catch-tanks from which to feed the village tanks. They are not storage tanks, but catch-tanks—a series of distributing basins at different levels.

29. Q. Where do you propose to work this system?—On the Katangi side.

30. Q. How high will the bund be?—Under 20 feet. Generally 16 feet with cross bunds.

31. Q. Would you bund up all the nallas?—I would not bund up the big nallas.

32. Q. (The President).—You will make sluices?—Yes, where the ridges are.

33. Q. How do you deal with the flood-waters of the nallas?—I should waste them at the back. Probably they may not require waste-weirs. You may manage it without waste-weirs. Minor nallas I would dam up.

34. Q. Big nallas form the limit of the system?—Yes, unless you put an anicut higher up and lead off the water to feed the tanks. For instance on the Chanda nalla, I have proposed to put up an anicut and lead the water away.

35. Q. In a time of drought it is only the big nallas that you can trust?—Yes. If you have an anicut, you can work the big nallas also.

36. Q. You have had nothing to do with the Chhattisgarh country?—No.

Mr. Craddock.—The reason why Mr. Morley went to Bhandara and Balaghat, is that Mr. Hutton came to these provinces in the famine, and drew up some projects in Chhattisgarh; he then went to the Wain-ganga district, but afterwards went on leave, and Mr. Morley succeeded him.

Mr. Muir-Mackenzie.—What led to the appointment of an Engineer on special duty?

Mr. Craddock.—In the famine we began to feel not only the want of water, but also some works, other than roads, on which to employ relief labour.

Mr. Higham.—Will you tell me something more about the observations that have been made of the rainfall and flood discharges? Have they been made on a very large scale?—I had 17 rain-gauges put up.

37. Q. Where?—At the sites of the proposed tanks.

38. Q. At the sites of the proposed tanks in these two districts?—Yes. I also had nalla-gauges put up where nallas existed.

39. Q. As regards rain-gauges, you found a certain number of them already in existence, I suppose?—Yes.

40. Q. Where were they—at the tahsil towns?—Yes.

41. Q. Only in tahsil towns?—That is all.

42. Q. How many of them?—Three.

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43. Q. Your own rain-gauges show records for one year only?—Yes, since I have been here.

44. Q. The principal value of these gauges is to compare the run-off of the year with the rainfall?—Yes.

45. Q. You have taken observations of the nalla discharges?—I have not. I meant to do it, but I have not had time. I had nalla gauge-men to take gauge readings every three hours during floods as I had no automatic arrangements.

46. Q. Do you know what discharges these gauges represent?—I did know to a certain extent because I had some typical sections made. I had no actual gaugings made during the flood season.

47. Q. No actual observations?—No, only gauge readings.

48. Q. Then the whole of the calculations as to the capacity of tanks are practically based upon the tahsil gauges?—Yes, the indication afforded by my gauges for one year are not worth much.

49. Q. The duty that you allowed for all these tanks, I understand, is two feet?—Yes.

50. Q. Two feet per acre for broadcast rice, and three feet for transplanted rice?—I have not drawn any distinction between one kind of rice and another. I reckon on two feet of water being sufficient, provided the tank is made one-fourth bigger than the mean monsoon capacity.

51. Q. That is all right as far as the capacity of the tank is concerned, but I am thinking of the amount of water required for cultivation?—They can get three feet when it is wanted. I have worked out the result for several tanks from the year 1893 to 1900.

52. Q. Do you mean to say that for a year of drought you have allowed 3 feet?—Yes.

53. Q. Your calculations show that if you do not make tanks bigger than the average monsoon capacity, they will fail in a famine year?—Certainly.

54. Q. What is the percentage of excess that you allow?—It varies with different gauges. It varies between 17 and 27 per cent. The average I have taken is 25 per cent.

55. Q. That should be the rule in designing all these tanks?—I think so.

56. Q. To build them bigger than the average monsoon capacity?—Certainly.

57. Q. To what extent have your calculations been checked by comparison with existing tanks? You mention here three tanks, and you compare the actual area irrigated with the contents of the tanks?—Yes.

58. Q. For what period? Is it for one year?—We have simply taken it for one year as a sample. We have taken the number of acres that have been irrigated in an average year and then compared the actual capacity with them. The result was what I stated.

59. Q. What do you call the capacity? Do you mean the capacity of a full tank?—The capacity of the full tank up to waste-weir level, the usual full water level.

60. Q. Have you not the area irrigated by these tanks in a series of years?—No.

61. Q. You say in reply to paragraph 4 of question 23: "In the Thondia nalla project 3,614 acres belonging to 34 villages utilise a capacity of 8,432 million c. ft., giving a duty of 17,792 c. ft." That may be the maximum capacity of the tank. You don't know what the actual contents of the tank were?—No; my calculations are only approximate. I took the capacity of the tank up to the waste-weir level and multiplied that by one-third of the depth; I also found how many acres are usually irrigated by the tank and struck the average from that.

62. Q. You do not know how far the tanks filled every year?—No, I assumed that they did; I did not go into such details; I only wanted to get a general idea.

63. Q. Do they all fill every year?—Not always; sometimes they fill many times in the year.

64. Q. How did you arrive at the area irrigated?—From the patwari's figures.

65. Q. What are the areas you were given? Are they the areas irrigated in a dry year or are they the maximum areas that have been recorded as irrigated or are they the average area irrigated in a year or are they the area assessed as wet?—I cannot answer that question precisely.

Mr. Craddock.—Where did you get your information from?—From my assistants in camp.

66. Q. You do not know where they got it from?—They got it from records: the figure will not stand a critical examination.

Mr. Higham.—What one wants to know is what area these tanks irrigated. These figures do not show that?—No. One can easily get that, when you know the evaporation and the contents.

67. Q. You, Mr. Harriott, and others assume that a tank will protect a certain area, the extent of which is based upon a number of assumption as to the quantity of water that would be required every month, etc. Is there any means of checking your figures by known results on tanks that have been in existence for years?—No, there have been no accurate observations; we are all in nubibus.

68. Q. Which is the best existing tank in the province?—The Nawegaon tank.

69. Q. Is anything known about it?

Mr. Craddock.—We know the area irrigated by it during the famine.

Mr. Rajaratna Mudaliar.—Have you got records of the area irrigated in each year?

Mr. Craddock.—Yes; it is recorded.

The President.—Mr. Morley does not know how the patwari arrived at these figures, and we have no accurate information about it.

Mr. Craddock.—The patwari must have supplied it from his records, but whether he supplied it from the current year's records or the settlement records, we do not know.

The President.—Has he got the actual area irrigated every year?

Mr. Craddock.—He records it.

Mr. Higham.—Are returns sent up as to the area irrigated?

Mr. Craddock.—Yes.

Mr. Higham.—You get the crop returns also?

Mr. Craddock.—Yes.

Witness.—All my projects are based upon the figures given me by the Deputy Commissioner. I am not responsible for those figures.

Mr. Higham.—Your figures give the area that can be protected by a tank and the capacity of the tank; you should know what the figures mean and what value to assign to them. You calculate that you will make up for any deficiency of the rainfall by giving out water from the tank. How is that going to be effected in practice? Under whose control will these tanks be?—That is not settled. We do not know what arrangements are going to be made. There is no doubt that the tanks must be under control.

70. Q. If you are going to charge a fixed rate on the protected area, people will have ideas of their own as to when they ought to have water?—If the tank is not under control, and if the people are allowed to take water whenever they want it, they rob the tank of its protective capacity.

71. Q. It must be under external control; when are you to know that the rainfall has been short?—10 or 15 days after the rains are due. Water ought not to be given without authority. If you let all your surplus water run away on the plea that people want it, you will not have water in a year of drought.

72. Q. Even supposing you have control, you must allow a considerable margin for unavoidable waste; for instance, you might get rain directly after having given water and thus give out more water than you now allow for when you take the rainfall of the month and say that with that amount of rainfall it would be necessary to give, say, a 4-inch watering?—I do not know how much extra ought to be allowed to cover such contingencies.

73. Q. Anyhow you must have a controlling officer. The control cannot be left to the people?—Yes.

74. Q. That means you must have an establishment?—Yes; it will cease to be a protective work if there is no establishment to control the supply and the people are allowed to draw water just when they want it.

75. Q. Have you had anything to do with the Chanda districts?—I have been there and made a few projects.

76. Q. All the works done hitherto has been in the way of impounding water in small reservoirs. Is there anything to be done by making anicuts across the rivers?—A great deal can be done, I think.

77. Q. Where?—The whole of the river system in the rice districts wants examining with a view to finding out what projects are feasible. I have not

paid much attention to this because I have been engaged on tank projects.

78. Q. Do the rivers run a sufficiently constant supply or would storage works be necessary?—I think you must have storage works, but the country must be examined first before one can form an opinion.

79. Q. Are there any gauging stations on the rivers?—I do not know of any.

80. Q. Looking at the river system in the Chanda district, there are many places commanded by rivers. But the question is whether they are constant in their supply?

[Mr. Harriott explained that levels were being taken for canals from the Wainganga in Chanda and that the river carried 530 cusecs on the 5th of February.]

81. Q. In the districts you have examined do you know of any sites for such works?—I have seen on the Wainganga one or two places where bunds could be thrown across the drainage, but the section of the valley is not promising.

82. Q. In the districts that you examined have you exhausted all the possible sites for reservoirs?—Not by any means. I have only found out some of the best ones.

83. Q. A great many more could be found?—Any number. In Bhandara there are lots of capital sites.

84. Q. There are a great many existing tanks?—Yes.

85. Q. What will be the effect of your projects on them: would you not stop their supply?—I should give them the waste water. I should not hurt them.

86. Q. They will be below you?—Generally.

87. Q. The fact of their being below you would mean that you will intercept a good deal of the supply that goes to them?—You are not obliged to take up their catchment areas. You can avoid taking the catchment areas of the existing tanks.

88. Q. Have you avoided them?—I have as a rule.

89. Q. In making new tanks, that is one of the first things to be considered, so that claims may not be made for compensation by people who are interested in the existing tanks?—I do not think you will find anybody bringing complaints in connection with my projects.

90. Q. You propose to fill these tanks with your waste water?—I can fill these tanks from my distributaries in many cases; if we do take up their catchment, we ought to fill their tanks.

91. Q. You say that the existing tanks, owing to want of repairs, do not hold as much water as they should?—Most of them do not hold anything like what they should hold considering their catchment area.

92. Q. Why is it? Are the banks not high enough?—The banks are not long nor high enough.

93. Q. Is the water very much spread?—Very much so.

94. Q. Do you think that anything can be done to improve them?—Yes. That is one of the first things that ought to be done.

95. Q. With reference to existing tanks?—Yes. We should make them as protective as possible.

96. Q. How do you propose to do it?—I should take them up individually.

97. Q. First of all you would survey the site and determine what is necessary to be done to increase the efficiency of the tank?—Yes. I should make it as efficient as possible.

98. Q. Then what will be the best way to do it?—That is a difficult question. I do not know how it should be done. I think if the owners did it they would not get it done properly, and they might make a mess of it. They do not know anything about building sluices.

99. Q. Suppose you do it for them?—We can improve the village tank and very likely make it hold more water than the village may want. The supply might be given to the village further on.

100. Q. The only way to do that is for the Government to take up the tank?—That is my suggestion. I want a Tank Acquisition Act.

101. Q. You think that as a matter of fact the capacity of many of the tanks may be greatly increased and irrigation extended to the surrounding villages?—Yes. In many cases the village tanks are very good and might be largely increased.

102. Q. Can you give particular instances?—There are several that can be taken in hand in connection with my projects—the Koka, for instance.

103. Q. Have you proposed to take it up?—No; but many of my projects include improvements of existing tanks.

104. Q. You think a great deal could be done by improving village tanks?—Yes, the first thing to be done is to improve what we have got and then add to them.

105. Q. But that is the part of the question that has not been considered?—There are 3,000 or 4,000 tanks in Bhandara alone. There is a very large field for improvement.

Mr. Muir-Mackenzie.—You say, "The system in vogue is very unsatisfactory, as most village tanks, owing to want of repairs, do not nearly hold the amount of water they might do." Do you mean that the ordinary current repairs, small repairs, are not sufficiently carried out, or do you refer to such improvements as structural alterations in the tank?—Structural alterations. Most of the tanks have no proper sluices. They generally cut the bund to let the water out and don't properly repair it again. Again, the bunds have got insufficient sections and very often breach, and the waste-weirs also are not properly built.

106. Q. Are not the ordinary repairs, such as the stopping of large holes and the keeping of bunds at proper height, properly attended to?—I should say they do nothing at all.

107. Q. Do you think that there is any way of getting the owners to do the small repairs if it is represented to them that they could get some advantage from it?—I do not think so. If you have a large system and leave it to cultivators to do it, it would not be done properly. All repairs should be done departmentally.

108. Q. By carrying out structural alterations, such as putting proper sluices, altering waste-weirs and raising dams, you think that a considerable addition might be made to the irrigable area?—Yes, I think so.

109. Q. Do you think that the people could not be stimulated to do anything in this direction, if they had it properly explained to them that the additional revenue that might accrue from the additional area irrigated was exempted from payment of assessment?—Most of the tanks have got no protected area and they lose all their water by evaporation as they are large shallow tanks. If you make dams high enough, it will be all right. The dams are generally small, 20 or 25 feet high. There will be 8 or 10 or 12 feet of water and you lose 6 feet by evaporation, so in the early part of the year the water is all gone and it never holds out till June. Some larger tanks do hold on.

110. Q. If you increase the height of the dam would it have the effect of making the tanks hold out till June or would it increase the area of present irrigation?—It might do either the one or the other. You might have to apportion the water that you have to certain areas.

111. Q. It depends also upon what use people would make of the water, whether they would keep it for growing second crops or more valuable crops or whether they would be inclined to use it at once for rice. I understand at present they do not require water very much after October?—Probably they will use it for rice.

112. Q. Would there be a larger area commanded by the tank?—There would undoubtedly be nearly 100 per cent. of extra land brought under cultivation.

113. Q. Is there always an area on which you could use the additional water?—Not in every case, but generally.

114. Q. In the cases in which there is an area for the water to irrigate, would the owners improve their tanks under advice from the Irrigation Department, if they were exempted from paying additional revenue in consequence of the additional area irrigated?—I think it is quite possible.

115. Q. Have you not discussed the thing?—I never discussed it, though I spoke about it to one or two people.

116. Q. I suppose they never said to you that the fear of wet assessment would deter them from undertaking the improvements?—They have not raised the question with me.

117. Q. Is water from these tanks taken by channels?—Yes, generally. But sometime they take it through a breach in the bund and spill it from field to field.

118. Q. Have you seen any of the percolation tanks which are common at Chhattisgarh where they say

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that irrigation is carried on entirely by percolation?—No.

119. Q. Are the channels of existing tanks kept in proper repair?—They are *kachcha* and there is an enormous loss by absorption in channels.

120. Q. Would you like general control by Government over tanks and channels?—Unless there is some control there must be loss of water.

121. Q. Suppose these tanks were put in as efficient a condition as you desire them to be in, their protective value would be increased in a year of drought?—Yes.

122. Q. In a year like the last famine year would there be rain to fill the tanks?—If they were improved on the scale that I propose, so as to hold 25 per cent. in excess of the mean monsoon capacity, they would be able to protect the country from any such famine as has occurred.

123. Q. What is the principle to be adopted?—The principle of making the tank 25 per cent. above the mean monsoon capacity. That will carry you through any serious famine, similar to either the famine of 1867–69 or 18 6–1900.

124. Q. Would you be prepared to say, with regard to a great many of the tanks which have been built without any scientific reference to their catchment or the amount of rainfall in the vicinity, that, by increasing their capacity in the way you proposed, you would be certain to get enough from the catchment to fill them?—They do not fill, but they carry you through a year of drought and carry you also to the next year as judged from the rain records.

125. Q. These rain records apply to all tanks?—I am only acquainted with Balaghat and Bhandara rain records and have had nothing to do with others. What applies to my proposed tanks also applies to existing tanks.

126. Q. I suppose a great majority of these tanks you proposed are suitable for famine relief?—Yes.

127. Q. You propose to build some of them with masonry?—Yes, but I may be able to do them in earth if it is desired.

128. Q. A great majority of these works are put in Class C. Do you agree to that classification?—Mr. Harriott has been basing his projects on 5-inch waterings, but I base mine on 6-inch waterings. He allowed 6 feet for evaporation, but I have allowed 6.3 feet. In regard to questions of rainfall, he has used Binnie's Constant and I have used 9/10ths of Binnie's Constant. I have been more cautious than Mr. Harriott.

129. Q. Do you think that some of these projects are worth being put in a higher class and made at once instead of being kept for another famine?—If you accept 5-inch waterings, you may consider that these tanks of mine would protect one-fourth to one-sixth more than what I have stated. That would be about the limit.

130. Q. Some of your projects might get a better return than Mr. Harriott's?—Yes.

Mr. Craddock.—They are not classed according to the desirability of projects but with regard to cost.

The President.—I suppose the Class A refers to reproductive works?—Remunerative works.

Mr. Muir-Mackenzie.—Do you think that a malguzar would take up the contract for improving a tank according to your specification?—I do not know any-

thing about malguzar's capacity for doing work of the kind. It is a simple work, but it wants departmental supervision.

131. Q. The system they have followed lately in Hyderabad is that they give an influential man the contract for the construction of a village tank and they pay him out of the revenue derivable from lands which are irrigated by the tank. Could you find men of consideration who would be able to execute such contracts to your satisfaction?—If the malguzar is capable of doing it, I should prefer to give it him rather than to anybody else, but he would want departmental supervision to make sure that he kept to the specifications.

Mr. Rajaratna Mudaliar.—In Hyderabad the tanks belong to Government, but here they belong to malguzars. You propose to acquire all tanks and carry out repairs at the cost of Government. Is that your proposal?—I might do the repairs to them. In cases where the tank is likely to serve a village outside the one in which it is situated, it ought to be built by Government. That would be an efficient way of getting out of the difficulty.

132. Q. In such a case would you not have to pay the original cost of the works to the malguzar?—We shall have to compensate him, I suppose.

133. Q. Don't you think that the cost will be somewhat prohibitive of carrying out such a scheme on a large scale?—If the malguzar made it prohibitive we should not touch his tank.

134. Q. Considering the peculiar practice in this province, the question is whether such a scheme can be carried out economically?—I do not see why we should not do it.

135. Q. Would it not be more economical to allow the malguzar to enjoy the fruits of his work and retain the whole irrigation share of the revenue and so practically compel him to keep the tank in order? The tank would remain his property as at present, but in consideration of his being allowed to enjoy the irrigation share of the revenue, which is now divided between him and Government, he might be compelled to keep the tank in order. Would that not be a more economical way?—I do not think so. Ultimately we should get Rs. 3 or 4 an acre and the repairs would not cost us more than 12 annas. If we adopt your proposal we would be making the malguzar a very substantial present.

136. Q. You admit that the tank is at present private property?—It would not cost much to buy up the tanks, because from the protective point of view these tanks are useless except the large ones.

137. Q. That is a different point. The malguzar gets a certain amount of revenue at present and if he is deprived of that revenue he will require to be paid the capitalised value of the revenue?—If you guarantee him such water as he wants it is a clear gain to him to surrender his tank and take a reasonable compensation.

138. Q. You guarantee him his water?—We guarantee him his water in the worst year.

139. Q. You propose that the Government should recoup itself the amount spent by way of compensation, from the increased revenue?—I do not know how you would deal with the man—whether you would remit a certain amount of wet revenue in lieu of paying compensation. That is a matter of arithmetic.

WITNESS No. 13.—MR. TULARAM, Naib-Tahsildar of Hoshangabad.

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1. Q. (The President).—Mr. Tularam, your paper came to us so late that we have not had time to read it and we cannot question you on it, as we should have wished. You write chiefly of the Hoshangabad district?—Yes.

2. Q. You are satisfied, I understand, that if the agriculturist knew his own interest well enough, he would irrigate black cotton soil?—Yes. I have fully discussed in what respects black cotton soil can be irrigated and in what respects it cannot be. In very dry weather there is no fear if black cotton soil is irrigated. But in case it is cloudy weather and there is constant rainfall, I do not think that irrigation on black soil will succeed. Of course there are certain patches in which it may succeed.

3. Q. I will put a case for you. The district is subject to famine. Suppose famine occurs once in ten

years and in other years the country is all right and it is black cotton soil, and suppose the Government have protected the country against famine by making a canal through it which costs a great deal of money, do you think that malguzars or cultivators in the neighbourhood would only use the water once in ten years when famine came and would decline to use it in other years?—No. If irrigation works be opened they will utilise them. In the Hoshangabad district I have learnt from some of the old farmers that some time ago they were cultivating rice, sugarcane, and wheat; and no sooner was the railway communication opened through the district the rabi crops began to fetch more prices than they used to do before. The cultivators of this country who were in the habit of selling crops wanted to convert every part of land into rabi crop field. Take the case of the Wardha district. The cultivators of this district are destroying their

gardens of *santra* and other fruit-trees and changing them into cotton fields, because it is fetching them better prices. Practically they have given up planting gardens. I have discussed the matter with *malguzars* and they say that these fruits do not bring in so much money as cotton does at present.

4. Q. Do you think that in the case I supposed, of places subjected to extreme droughts and water flowing through them every year, there being sometimes more rain and sometimes less—do you think that the agriculturists would, by degrees, take to using water? Of course they will have to pay for it—They will use it as far as they can properly utilise it.

5. Q. That is just the point. Can they properly use it?—They can utilise it. When they see that water does harm to certain crops they will not take it.

6. Q. Do you think that in 5 years out of 10 it will be profitable for them to take it?—Yes. Winter rains in excessive quantities are not usual.

7. Q. Do you think they will take it for 7 years out of 10?—What I mean is this: if there be water storage in the district, they will utilise the water in various ways.

8. Q. But will they pay for it?—At present the people of Hoshangabad are not prepared to pay any tax. The constant failure of crops has impoverished them. If you look into the figures regarding acreage of cultivated lands during the last decade you will find that the area is going down and down, and that every year some plot or other is abandoned. This cultivators are in want of bullocks, seed-grains, as well as capital. At present if the Government is willing to improve the condition of the people I think more liberal terms should be given to them.

9. Q. That is a general question that we can hardly go into. If you think that irrigation will help them we can consider that point. You say that people have abandoned cotton in favour of wheat and they grow more wheat and less cotton than they used to do?—They grow more wheat than rice and sugarcane in Hoshangabad, whereas in Wardha they are growing cotton more than any other crop.

10. Q. Do you think that in Hoshangabad if water was given they would change the rabi crop and grow rice?—Yes, I have discussed this subject with *malguzars* at several centres when I collected them and lectured to them. They are willing to change, provided they get water. They want to extend the area of rice irrigation.

11. Q. Are they willing to pay for water?—When they gain they will pay.

12. Q. Will they pay Rs. 2 an acre?—No. That will be too much. Suppose a tenant has got ten acres, he cannot pay Rs. 20 as water-rate.

13. Q. It does not matter whether he has 10 acres or 2 acres: will he pay Rs. 2 an acre?—No; because at present they cannot pay their rents fully.

14. Q. How much do you think they ought to pay?—Rs. 2 is too much.

15. Q. (Mr. Rajaratna Mudaliar.)—If he has to pay Rs. 2 on the actual area irrigated, will it be too much?—Yes. Cultivation requires a good many things for which the ryot has to pay, such as manure, seeds, bullocks, etc. After all, what is the outturn?

The President.—Of course unless he benefit by it he will not take the water?—Yes. But Rs. 2 is too much for a water-rate.

Mr. Craddock.—Do you say that you should charge him nothing if he is to grow rice?—In Chhattisgarh they grow rice and we give water, but we cannot charge him Rs. 2. The tenants contribute towards the repair of the tank. When there is a break of rain in a year we give them water and they contribute at the end of the year something towards the repair of the tank. In this way *malguzars* distribute water.

16. Q. (Mr. Rajaratna Mudaliar.)—You don't get any water-rate at all from your tenants?—No. Suppose we give them water this year we ask them to pay something at the time of their paying rent, i.e., Rs. 2 or 3 per *nagar*, which consists of 24 acres of land. Of course all these 24 acres of land are not irrigated.

The President.—You approve of wells being sunk in the Hoshangabad district?—Yes.

17. Q. There are very few agricultural wells, I suppose?—Yes; but during the last two years, they have been sinking more wells, and the practice of irrigation is increasing.

18. Q. Are these wells sunk in black cotton soil?—Not generally. In black cotton soil wells are very deep, especially along the Nerbudda river. They do

sink wells along the Tawa river and near the Satpura Hills.

19. Q. What does it cost to make a *kacha* well into a *pakka* well?—People of Sangakheda village on the bank of the Tawa want Rs. 70 or 80 per well, whereas in one village called Jamani, where the water level is still less in depth, they want Rs. 50. They told me that Rs. 30 would be quite enough. But I do not suppose that it will be enough.

20. Q. Is that to make a *kacha* well into a *pakka* well?—Yes; with brick and mortar.

21. Q. How deep?—10, 15 or 20 feet.

22. Q. Do you mean to say that if a man gets a loan of Rs. 50 he could build a *pakka* well with it?—Yes; if they make *kacha* wells by the side of rivers they sink down soon and they have to repair them. But if they make a *pakka* well it does not sink down.

23. Q. (Mr. Rajaratna Mudaliar.)—What is the diameter?—Four to 5 feet.

24. Q. (Mr. Muir-Mackenzie.)—What part of the country do you belong to?—Chhattisgarh.

25. Q. You are a native of Chhattisgarh?—Yes.

26. Q. You have said a good deal in this memorandum about Chhattisgarh. That is from knowledge that you have picked up during your residence in the country. Is that so?—Yes.

27. Q. What makes you say that when a village is re-assessed, the subordinate survey party stands on a high embankment and does not estimate properly the irrigated area?—That is the opinion of the people.

28. Q. Have you taken part in such a survey?—No.

29. Q. Have you yourself ever looked at the irrigable area and compared it with what is given in the village papers? Have you any reason to suppose from your own enquiry, first-hand enquiry, that the irrigable area given in the village papers does not represent the true irrigable area?—People generally complain of it.

30. Q. That is what they said to you. Have you looked into the question by comparing the actual irrigable area with what is given in the village papers?—I have not been engaged in the settlement of a village.

31. Q. You say what the people have been telling you?—Yes.

32. Q. You made some enquiries of the people of Hoshangabad?—Yes.

33. Q. Here you say that the irrigable land can be more easily tilled and with less number of cattle than unirrigable land?—Yes.

34. Q. That is not the general experience. It wants more thorough working than the dry land?—Naturally the ground becomes soft. When you prepare an embanked wheat field it requires very little labour. Where it is not a banded field cattle suffer a good deal. In our laterite soil we cannot till the land until there is a shower of rain, when it requires less amount of work. On account of dryness, the ground becomes hard and less area can be tilled.

35. Q. You say that the cultivators are not in the habit of manuring their fields. You say "I have seen persons selling manure?"—That is in Hoshangabad.

36. Q. I am alluding to that. Does it take place to any large extent?—No. They generally utilise the sweepings of their own houses.

37. Q. It is the refuse of their own houses?—Yes.

38. Q. Night-soil?—They do not collect night-soil.

39. Q. You say that the greater portion of the area is black cotton soil and three-fourths of the total area is under wheat. Is the soil suitable for the cultivation of cotton?—I have seen certain fields of cotton near the Satpura Hills and the nature of the soil is to a certain extent exactly like that of Berar. I did not notice cracks which are generally found in black cotton soil. The cotton crop was also good.

40. Q. What is it that made the people abandon the cultivation of cotton?—They generally say that when the railway communication was opened there was a great demand for wheat for export and they began to cultivate more wheat.

41. Q. You say that cotton is more valuable than oranges?—That is not in Hoshangabad.

42. Q. If cotton is more valuable why don't you cultivate? Besides the railway helps the people to export cotton?—Yes.

43. Q. Therefore the railway coming in cannot have induced them to give up the cultivation of that

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crop?—They abandoned rice and sugarcane in Hoshangabad. In Chhattisgarh it was a custom for some time that the cultivators did not like to sell kharif crops, bdan, and kodo crops. They used to sell surplus wheat and other rabi crops. But they are now selling every crop. So it was the case in Hoshangabad. They were growing sugarcane and rice and they thought that the cultivation of those crops was more costly than the cultivation of wheat.

44. Q. My original question is: if the soil is suitable for cotton why don't they cultivate it? Why do they stick to wheat?—They stick to cotton in some parts.

Mr. Craddock.—Is it not a fact that in the greater part of Hoshangabad the land gets too much waterlogged for cotton?—They generally grow cotton along the side of the hills but not in black cotton soil. I have seen towards Rampuri that much cotton is sown, and especially in the Harda tahsil.

Mr. Muir-Mackenzie.—I gather that you would like to see rice cultivation extended in Hoshangabad?—Yes; it is safer than wheat in many respects.

45. Q. Why?—When once the rice crop is grown and properly weeded, it gives at least some outturn. It requires only one watering at the end.

46. Q. How many waterings does wheat require?—Not many. But there are a good many other difficulties.

47. Q. There is the rust?—Not only rust. Suppose there is a break at the beginning of October they cannot properly prepare the fields.

48. Q. You think that rice cultivation would be more profitable than wheat cultivation in this tract?—Now-a-days rice and wheat are both paying. The outturn of rice is more than the outturn of wheat although rice is sold cheaper. Thus they amount to the same thing.

49. Q. Rice would not fetch a larger return per acre?—But it will save the country.

50. Q. Would the return per acre be larger?—I consider it a preventive measure.

51. Q. That I question. I want to know whether the return per acre would be larger?—I don't think it would, because the outturn of rice is 20 times, whereas the utmost that wheat can produce is 8 times.

Mr. Craddock.—In what part of Hoshangabad was it that they used to grow sugarcane and rice?—In some of the villages along the Tawa and near Jamani.

52. Q. It is a limited part of the district?—Yes.

53. Q. Is the small part that you are speaking about the same as that to which Mr. Sly alludes?—Yes.

54. Q. Was the sugarcane watered from wells?—Yes.

55. Q. What happened to the wells?—Many were abandoned, for instance, in Sangakheda and in Jamani.

56. Q. Would 50 villages cover the area you speak about or 20 villages?—I cannot remember exactly the number in the whole district.

57. Q. Roughly speaking, is the tract that you are speaking of a narrow strip of villages along the river?—Yes.

58. Q. What you say about rice and sugarcane does not apply to Hoshangabad?—If rice is introduced into black cotton soil, it will pay. The whole of Dhamtari tahsil, where people are in the habit of growing rice, is black cotton soil.

59. Q. Do you think that the people of Dhamtari are better off than the people of the wheat tracts? Are they richer than the people of Narsinghpur?—Narsinghpur and Hoshangabad are well known for their richness. The Dhamtari people are not so rich.

60. Q. You would not say that the rice cultivators are better off than the rest?—At present not so well off, I think.

WITNESS No. 14.—Mr. JOSHI, Superintendent of the Agricultural Farm at Nagpur.

Mr. Joshi.
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1. Q. (The President).—You have heard the evidence that has been given by Mr. Tularam. What is your opinion about the question of black cotton soil and water?—That is whether it can be irrigated or not?

2. Q. Whether it is profitable to irrigate it?—It is profitable to irrigate it in years of drought, but not otherwise.

3. Q. I do not know if you heard the case I put to Mr. Tularam. Suppose there was a famine once in ten years in the district and the Government, wishing to protect the district from famine, made a canal through it and supplied water. Would the cultivators take water only in famine years or would they take it in other years?—They will take it in other years also.

4. Q. If it was black cotton soil?—They would not take it for crops, but they would grow gardens.

5. Q. That would be on a small area?—It will be on the sides of the canal.

6. Q. Would they grow sugarcane?—Sugarcane will pay.

7. Q. Sugarcane on black cotton soil?—Yes, and also ginger, onions, and such crops.

8. Q. Do you think that they would take water on a large scale?—Not on a very large scale.

9. Q. If you have a canal made at a great deal of expense and fit to irrigate one hundred thousand acres it would not be much satisfaction if they took it for 100 or 500 acres only. Would they take water for wheat?—Yes, if we have such years as the last five.

10. Q. They are exceptional?—In other years they would not take it.

11. Q. Will they change wheat into rice?—Never.

12. Q. Sugarcane has been driven out, I understand, by the railways?—Not by the railways but by the cheap sugar which has been imported.

13. Q. That is by railway, is it not?—Yes.

14. Q. From Northern India?—Yes.

15. Q. Have you seen sugarcane in the north of India?—I have seen a small tract of it.

16. Q.—Can they grow it there cheaper than here?—Yes, owing to canals.

17. Q. If the Government made a number of small reservoirs or tanks for water in the Central Provinces,

the chief thing that would be grown would be rice?—Yes.

18. Q. Would the cultivators also grow sugarcane?—Yes. I am told that in the Bhandara district they were growing sugarcane in large quantities, but now they have ceased to grow it.

19. Q. Why?—Because they have not got sufficient water.

20. Q. On account of these years of drought?—Yes.

21. Q. The great enemy, I understand, to the growth of wheat in the Central Provinces is rust?—Yes.

22. Q. I understand that you are trying to arrive at a means of producing wheat that will not have rust?—Yes; it will take some years.

23. Q. You don't think it is impossible?—No.

24. Q. Does this rust affect any other crop?—Yes, linseed.

25. Q. Rice?—No.

26. Q. Sugarcane?—It is not affected by rust. It has got borers and other diseases.

[At this stage Mr. Mollison, Director-General of Agriculture, was requested by the Commission as an expert to examine the witness.]

27. Q. (Mr. Mollison).—What is the general character of the soil here?—Black cotton soil.

28. Q. How deep?—From 4 to 10 feet.

29. Q. What is underneath?—Gneiss rock.

30. Q. Not moorum?—No.

31. Q. Does that character of sub-soil extend very far in the Central Provinces?—Yes.

32. Q. What is the ordinary dry crop grown on that description of soil?—Wheat and linseed.

33. Q. Wheat is a very important crop?—Yes.

34. Q. You have had experience in growing wheat for a good many years. How many?—For the last 14 years.

35. Q. With and without manure?—Yes.

36. Q. With and without irrigation?—Yes.

37. Q. Without irrigation and with manure, in your experimental farms, what have been the general results that have been obtained—regular or irregular

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crops; good or bad?—Without irrigation results are bad.

38. Q. To what do you attribute that?—To insufficient moisture.

39. Q. You are always liable to have that condition?—Yes.

40. Q. It has happened during the last 14 years, during the time you have been in charge of the farm?—Yes.

41. Q. With irrigation and with manure you have had more regular results?—Yes.

42. Q. And got good crops?—Yes.

43. Q. What do you call a good crop?—Six hundred lbs. to an acre.

44. Q. I have seen irrigated lands yielding a great deal more?—May be.

45. Q. There is the extra cost that is involved in giving irrigation and giving the manure necessary to produce a good crop. What do you think it is? How many waterings are required?—Two.

46. Q. At the most?—Yes.

47. Q. In some seasons only one?—Yes.

48. Q. The extra cost of putting on water does not amount to a great deal?—Yes.

49. Q. How much per acre?—I have not got the exact figures.

50. Q. You are a practical agriculturist. You ought to be able to know approximately whether it cost one rupee or Rs. 2 or more per acre?—It will come to 3 or 4 rupees.

51. Q. You think so?—Yes.

52. Q. The extra cost of keeping up the crop under irrigation is Rs. 3 or Rs. 4, that makes the difference between good and bad crops?—Yes.

The President.—Does that include manure?—Yes.

Mr. Mollison.—To bring enough water on to the field do you lay out the land into beds or do you till the land more or less as you do for dry crops?—I lay it out in small beds in which case only I can control irrigation.

53. Q. Your plots are small?—Yes.

54. Q. Suppose you have got to do it in big fields of 10 or 15 acres, what difficulty would you experience in leading water on to those fields? If the land has cracked and has become absorbent of moisture in the rabi season, what difficulty would you have in leading on a large quantity of water?—Such quantity as I require for the purpose of irrigation would be wasted if I irrigate the land only once and after such a long time as to produce big cracks.

55. Q. A great deal of it would be wasted if you take the water to a considerable distance?—Yes.

56. Q. If you take it to a near spot you don't lose?—Yes.

57. Q. If you carry it to any distance you will lose much?—Yes.

58. Q. (Mr. Muir-Mackenzie.)—May we take it that Rs. 4 per acre would be sufficient?—Perhaps not. It may be more than that.

59. Q. 5 or 6?—Yes.

60. Q. (Mr. Mollison.)—Because the deep black cotton is cracked to such an extent that it gulps down a great deal of water and as the water is being conveyed to a large distance, there will be more loss?—The water which has gone below one foot in depth is of no use to me.

61. Q. (The President.)—Is it the same whether you have a large field or a small field?—That does not matter. I found when I was irrigating small plots of land that as I was irrigating one plot and standing on another which was not to be irrigated, I heard the gurgling noise of the passage of water below. That water has no effect upon the field at all.

62. Q. It is all lost?—Yes.

Mr. Mollison.—You have Kachi cultivators in the neighbourhood of the farm?—Yes.

63. Q. Where do they come from?—The North-Western Provinces.

64. Q. Brought down to teach people better methods of growing crops than those that prevail in the Central Provinces?—Yes.

65. Q. Have they been able to do so?—Yes.

66. Q. What crops do they grow?—Cabbages, vegetables and sugarcane.

67. Q. What water do they use?—Ambajheri water.

68. Q. Is the soil of the particular holding cultivated by them of the same description as the soil of the farm?—Yes.

69. Q. Are you sure of it?—Yes.

70. Q. Is it not more an upland land?—It is in a higher situation.

71. Q. It has a better drainage and it has a slope to the nalla?—Yes.

72. Q. It is not so deep as yours?—Yes.

73. Q. It has moorum underneath it?—Yes.

74. Q. That combination of soil is more suitable for continuous irrigation than the deep black cotton soil of your farm?—Yes.

75. Q. Would you class that soil as a description of soil on which cotton and ordinary crops are usually grown?—Yes.

76. Q. You would not class the soil on which the Kachi cultivators grow their crops as pure cotton soil?—No.

77. Q. How many Kachi cultivators are there?—There are 16.

78. Q. How many members are there?—There are 16 families and I have given fields to 16 members of those families.

79. Q. You have given fields to 16 individual members, but how many people do they have?—From two to three hundred.

80. Q. Do you think that they are employed on hard labour?—It is all hard labour.

81. Q. How many people are included in the 16 families?—Their women do not go to work.

82. Q. Still they are supported from the produce of their holding?—Yes.

83. Q. How many additional people do they employ? Can you say that 100 people are supported?—Yes.

84. Q. How big is the field?—Twenty-five acres.

85. Q. One hundred people are absolutely supported from the produce of 25 acres and are making a very good living?—Yes.

86. Q. They are probably saving money too?—Yes.

87. Q. Has this cultivation extended?—Yes.

88. Q. By the example of these people?—Yes.

89. Q. Do the people come and see what they are doing?—Yes.

90. Q. They have extended it to south of Nagpur?—Yes.

91. Q. You told me they were jealous of other people coming and seeing it?—They are not very jealous but they do not like it.

92. Q. Their cultivation is so profitable that they are afraid that a great extension of similar cultivation would take the money out of their pockets?—Yes.

93. Q. What would you estimate a good crop to be worth in that particular land? How much per acre? It would give Rs. 600 to 700 per acre.

94. Q. That would be a perennial crop?—Yes.

95. Q. Supposing they grow several crops in succession throughout the year, what would each of these crops be worth?—It is from all these crops together that they can get Rs. 600 to 700 per acre.

96. Q. They get large quantities of manure from you?—Manure they get from me—poudrette.

97. Q. And water free?—Yes.

98. Q. What do you charge per acre?—Rs. 50.

99. Q. You say that the gross outturn is worth Rs. 600 to 700 per acre and that these people are jealous of other people coming to see what their cultivation is like, and therefore the rental of Rs. 50 per acre that you charge for the sale of water is less than what it should be?—Yes.

100. Q. That the charge for manure and water is less than what it should be?—Yes. Originally our charge was Rs. 2-8-0 and from that we have gone up to Rs. 50.

101. Q. (The President.)—These lands which these Kachi cultivators are irrigating—would you speak of them generally as black cotton soil?—I would say black cotton soil or medium black cotton soil.

102. Q. Is there a large area in this country of that kind of soil?

103. Q. (Mr. Mollison.)—There is a large area on the borders of Khandesh and there is an equally considerable area of land for extension of well irrigation

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north of Katni. How deep is the well constructed in this particular *kacha* holding?—Twenty-five feet.

104. Q. How much will it cost?—Rs. 140.

105. Q. Does the water last throughout the year?—It has lasted in the famine year.

106. Q. Why has this particular occupant gone to the cost of constructing a well?—Because he had some money and he constructed it in the famine year as he could not get water from the Ambajheri channel which was stopped.

107. Q. Does he use the well?—Yes. I have given him water for 8 months' irrigation, for which the rent is Rs. 25. Since he has built that well he is having 12 months' irrigation, while others I am charging Rs. 50.

108. Q. Does he irrigate the land by the well during the 12 months?—No. For other months he gets water from me.

109. Q. He irrigates from the well during the hot months?—From April to June.

110. Q. How many days elapse between each watering?—4 or 5 days.

111. Q. One watering for every 5 days?—Yes.

112. Q. Are you sure of it?—Yes.

113. Q. Is not the period longer?—No.

114. Q. I should have imagined it was longer?—No. He irrigates a smaller area.

115. Q. Suppose he has got a patch here which he irrigates to-day, when will he irrigate it again?—Four or 5 days hence.

116. Q. Will he do the same in the hot weather?—Yes.

117. Q. If he irrigates once in 4 or 5 days he runs to considerable expense?—Yes.

118. Q. I suppose it pays him?—Yes.

119. Q. How much would the cost amount to if he irrigated throughout the year?—He must keep one pair of bullocks for drawing water throughout the year.

120. Q. Would it be Rs. 100?—Yes.

121. Q. Your charge of Rs. 50 is for water and manure?—Yes.

122. Q. Do you believe that with manure there is a great hope of well irrigation of that sort extending generally in the province?—Yes.

123. Q. How would it be restricted?—In some places the wells are very deep and it is very tedious to draw water.

124. Q. Here you get, in what is called an upland situation, what is ordinarily described as the black cotton of the district, with water 25 feet below the surface?—Near the farm we have no water up to 75 feet.

125. Q. How do you account for it?—Because it is gneiss rock, we don't get water. There it is moorum soil.

126. Q. Is there a hope of well irrigation with this description of soil?—If there is gneiss rock, I should say no.

127. Q. (Mr. Muir-Mackenzie.)—In similar soils wherever you can get water at a depth of 25 feet, do you think there is hope for considerable extension of irrigation?—Yes.

128. Q. (Mr. Mollison.)—You consider there is a greater scope for that class of irrigation than for irrigation by canals on a similar class of lands?—I depend much on well irrigation, much more than on canals. Under well irrigation water is much more under control than in canal irrigation.

129. Q. (The President.)—Do you know the Ramtek country?—I saw it only once.

130. Q. Do you know whether the soil there is suitable for irrigation?—I saw it when I passed through Ramtek. I think that soil is suitable for irrigation.

131. Q. (Mr. Muir-Mackenzie.)—If there is some hope for an extension of well irrigation in soils of this description, why do you suppose that canal irrigation if canal water were supplied, would not be availed of extensively on similar soils?—On similar soils it will be.

132. Q. Do you consider that irrigation by wells is likely to prove more profitable than irrigation by canals?—Well water is better for irrigation than canal water.

133. Q. Why?—Because well water contains a lot of salts.

134. Q. What do you base that conclusion on? Have you analysed well water?—I have done it to a little extent.

135. Q. (Mr. Mollison.)—Such soil as is suitable for well irrigation does not extend to large blocks, but would be found only in patches?—Yes.

136. Q. (Mr. Muir-Mackenzie.)—On what would you base that conclusion? Will there not be large tracts at the foot of the hills?—There may be.

137. Q. Do you know Hoshangabad at all?—No.

138. Q. Do you know any of the tracts where they embank fields for wheat cultivation?—I have not seen them.

139. Q. Have you never seen anything of the Haveli system?—I have not seen Jubbulpore where it is carried out on a big scale.

140. Q. Have you seen it carried out on a small scale?—We have done it on a small scale in our farm. We had to break it up, because it was unsuccessful.

141. Q. Why?—Because the black cotton soil could not hold water.

142. Q. On genuine black cotton soil embanking would be of no good?—Yes.

143. Q. You have been lately in Chhattisgarh?—Yes.

144. Q. Amongst other things you explained to the ryots there the possible value of the dry-crop *juari*?—

145. Q. On what class of lands could this dry crop be introduced?—Could it be introduced on lands commanded by tanks?—No.

146. Q. You must have it outside the tanks?—Yes.

147. Q. There you think it might be introduced with advantage?—Yes.

148. Q. Will it give a larger yield per acre?—Yes.

149. Q. It can be used for fodder?—Yes, for improving the breed of cattle.

150. Q. The cattle now depend upon rice fodder and therefore they are a small breed?—Yes.

151. Q. I believe you managed to convince at least one man of the utility of dry crops both for food and fodder?—Yes.

152. Q. But it was very difficult to convince him?—I had to prepare a cake and show him how it should be done.

153. Q. You had to entice the cattle by putting oil on the cake?—Yes, oil-cake.

Mr. Muir-Mackenzie.—What Mr. Joshi did was he went down among the people and gave them some idea as to what crops should be put. They said that their cattle would not use this dry fodder and they did not care to eat green *juari*. Mr. Joshi showed them how to make a cake of *juari* and he had to eat it himself and then one of the men ate it and took twice as much as any man would ordinarily eat. With regard to fodder Mr. Joshi had some fodder chopped and put some oil-cake on it and the cattle took it greedily. He is in hopes of hearing that cattle eat them without such inducements.

154. Q. (Mr. Muir-Mackenzie.)—Have you ever given a watering to a cotton crop in a year of drought to save it?—Never.

155. Q. You never found it necessary—not even in a bad year?—No.

156. Q. Did not the cotton crop fail generally in 1899-1900?—It failed in Wardha. Then I was in Nagpur where we had 13 inches rainfall and our crops were successful. Whenever there is scanty rainfall the cotton crop is very successful, but never so with too much rainfall.

157. Q. With scanty rainfall although the quantity may be great, the quality is decreased?—The quality is affected only a little. The fibre is a little weak, but otherwise the yield is a bumper one. In those two years, the famine year and the succeeding year, my outturn in the farm was 1,900 lbs. per acre, while in other years I got only 300 or 400 lbs.

158. Q. (The President.)—On account of drought?—Yes.

159. Q. (Mr. Muir-Mackenzie.)—In other years?—300, 400 or 500 lbs. at the most, after using stall-dung and box-dung.

160. Q. (Mr. Rajaratna Mudaliar.)—With the same quantity of manure?—Yes.

161. Q. (Mr. Muir-Mackenzie.)—In what year were you in Chhattisgarh?—This year.

162. Q. Did you happen to observe how the wells behaved?—I did see a single one. They are dependent on tank water.

163. Q. What is the reason?—I do not know.

164. Q. You don't think that the rainfall is so certain that people do not feel the necessity?—That must be the reason.

165. Q. In the returns sent there are not many wells shown. Have you not seen sugarcane?—You can't get green chilly to eat. How can you get sugarcane?—At Mungeli I saw two or three wells.

166. Q. What crops were they irrigating under them? They were only house wells.

167. Q. If you went down to the district and lectured on the advantages of wells and also if you had a sum of money placed at your disposal to make wells, do you think there will be chance of getting people to appreciate the advantages of wells?—Yes. If I were to give them wells 15 or 20 feet deep at which they could find water, I am sure they would take to them.

168. Q. (Mr. Mollison.)—Would you find water at that depth?—Yes. Some tanks which I saw and which were put down in famine were all dry. I asked the people why it was and they said that even in the rains there would be no water in the tanks, and as soon as the water fell on the ground it simply soaked in and there was no catchment area at all for the water. The moment the water fell it used to sink into the murum soil which was disintegrated laterite.

169. Q. (Mr. Muir-Mackenzie.)—If you show them a good crop under a well they would take to it?—Yes.

170. Q. Do you think rice could be made to pay under a well?—Rice requires a large quantity of water, and I do not think it will pay.

171. Q. (Mr. Mollison.)—The last one or two waterings when tanks failed could be done by a well?—Yes. Generally rice requires a large quantity of water.

172. Q. (Mr. Muir-Mackenzie.)—You would sink wells in the area irrigated by tanks?—Yes.

173. Q. (Mr. Rajaratna Mudaliar.)—You are growing Egyptian cotton on the farm?—Yes.

174. Q. Is the average yield from that cotton more than what you obtained last year from the irrigated cotton, viz., 1,900 lbs.—That is our local variety. But this Egyptian cotton I grow under irrigation.

175. Q. Is the yield of Egyptian cotton under irrigation greater than that of the local variety?—No.

176. Q. What is the amount?—600 to 700 lbs.

177. Q. What did you realize by Egyptian cotton as compared with that of local cotton?—The difference was sometimes Rs. 70 per bhoji (345 lbs.), whereas the Egyptian cotton was sold at Rs. 240. The Empress Mills Manager gave me the cost.

178. Q. Though the yield was less, yet the profit was much higher?—Yes.

179. Q. (Mr. Mollison.)—Suppose you were farming yourself, which would you grow?—I would not be satisfied with Egyptian cotton alone. I would have both.

180. Q. Have you made hybrids of Egyptian cotton and country cotton?—I have.

181. Q. (Mr. Rajaratna Mudaliar.)—You said that you got a rent of Rs. 50 per acre from the 16 families that had settled down here. Do you get that rent from the whole plot of 25 acres?—Yes. Each family might hold half or three-fourths acres or more according to their means.

182. Q. For 25 acres you get Rs. 1,250?—Yes.

183. Q. What do the tenants get? Have you made any estimate?—500 to 600 per acre. They are now big merchants regularly lending money.

184. Q. They get Rs. 500 or 600 as profit?—Yes.

185. Q. What do they grow?—Sugarcane, chillies and brinjals.

186. Q. All garden crops?—Yes. Very nearly half grow sugarcane. They do not extract the juice from sugarcane, but they sell it for chewing.

187. Q. Do you think they would have realised the same profits if this cultivation had been carried on in rural villages?—It would have been a little less.

188. Q. How much less—about half?—About one-fourth.

189. Q. Even supposing it is half less, don't you think it would pay the ryots?—Yes, it would.

190. Q. (Mr. Muir-Mackenzie.)—Why would it be less in rural villages?—There the sale would be slow.

191. Q. (Mr. Rajaratna Mudaliar.)—Would they get manure?—They would not get it. Here in the vicinity of the city we get manure. At present we are not realising any profits, although we are charging Rs. 50 per acre. I am spending much money.

192. Q. What amount of manure are you giving them free; what would you realise if you sold the manure?—I pay Rs. 1,145 for manure to the Municipality.

193. Q. You get in return Rs. 1,250?—Yes.

194. Q. You get practically very little?—I was working at a loss for some years. It is only from last year I have been getting Rs. 50. Up to that time the rent was Rs. 12 to 15, but never went beyond Rs. 20. My experimental farm was suffering, and everybody used to say, "You are going on spending and your receipts are very small."

195. Q. (Mr. Muir-Mackenzie.)—The reason that they get water and manure for nothing is they have been brought down here to show an example of high cultivation?—That is not the chief object. The object was to see the use of night-soil as manure.

196. Q. (The President.)—Are the cultivators about here following the example set by these men?—They are using manure.

197. Q. The object has been attained?—Yes. We got 3 cultivators—one a Brahman and two others Kurmis. They are given manure and asked to cultivate. The condition is that they must use the manure with their own hand.

198. Q. (Mr. Rajaratna Mudaliar.)—If your tenants are making a profit of Rs. 500 an acre, don't you think it is time to raise your rent?—I am thinking of doing it from April next, when my term of agreement with them expires. Our new leases commence in April.

199. Q. You are irrigating wheat on the farm?—Yes.

200. Q. Is the outturn of the irrigated wheat better than the outturn of unirrigated wheat?—Yes.

201. Q. If that is so why don't people take to irrigating their wheat fields?—Where are the means?

202. Q. Supposing canals were constructed and water is supplied to them at a low rate, would they not take to growing irrigated wheat?—Yes. If they get such areas as these.

203. Q. And not otherwise?—No.

204. Q. You have been carrying on experiments with wheat for 14 or 15 years?—Yes.

205. Q. You have been able to grow irrigated wheat in years of rainfall?—They have had rust in such years. Every report will tell you that there has been rust in such and such a year.

206. Q. Your experiment to grow irrigated wheat has not been a success?—Not in such years. During the past few years it has been a success.

207. Q. In this province rice is sown broadcast to a very large extent?—Yes.

208. Q. Would you tell us what the difference is in the outturn between rice sown broadcast and rice transplanted?—I have been very few times in rice-producing tracts. During the last three years that I have had the Telankheri farm, I had patches of rice. In one place I have transplanted rice and in another broadcast rice. There is another system called *beasi*, where the sowing of rice is done by broadcasting and ploughing. The difference between broadcast rice and transplanted rice is between 300 and 400 lbs. per acre.

209. Q. What is the percentage?—If the outturn of the broadcast rice is 1,000 lbs., that of transplanted rice is 1,500 lbs.

210. Q. That is 50 per cent. more?—Yes.

Mr. Craddock.—In dry years when would you irrigate wheat?—In quite dry years one irrigation is required at the beginning of the season.

211. Q. In October?—Yes.

212. Q. Do you think that in dry years generally, where you have a wet October, it would not be necessary?—Yes.

213. Q. Is it not the case that if you have January and February wet there is more likelihood of rust for wheat if irrigated in October than if it were not?—Yes.

214. Q. Consequently when you irrigate in October you do not know what may happen afterwards and you may be doing the greatest harm?—Yes, that is the risk.

215. Q. Although October may be quite dry and crops may require irrigation, yet you may be laying

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Mr. Joshi. yourself to great danger by irrigating it in that month?—Yes.

7 Mar. 02. 216. *Q. (The President.)*—The crop would not germinate if there is no rain?—Yes.

Mr. Craddock.—There is wheat all over the country, although there is no October rain.

(Mr. Muir-Mackenzie.)—Is wheat sowing done in September?—No. It is done in October.

217. *Q.* I understand you sowed very early?—I sowed this year at the beginning of October. I used to sow wheat generally on the 24th October and linseed

early in October. The first crop is linseed and the second crop is wheat. This time I had to sow my linseed in September.

Mr. Craddock.—With reference to Kachi cultivation, you could not, even if the soil admitted it, extend it very greatly?—You could not multiply garden products indefinitely or your market would fail? Suppose you were to put 20,000 acres under garden cultivation, what would be the result?—The market would be flooded.

218. *Q.* So the extension of garden crops would be very limited?—Yes.

WITNESS No. 15.—The Hon'ble L. M. St. Clair, A.M.I.C.E., Superintending Engineer, Central Provinces.

Replies to printed questions.

Mr. St. Clair.

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No reliable statistics are available as to the depth of silt accumulation in irrigation tanks, which in the Central Provinces are all private property and managed by the owners. Some information can be given regarding the silt accumulation in the three tanks which, though not irrigation tanks, form the storage reservoirs for the water-works of the cities of Nagpur, Jubbulpur and the town of Khandwa. I do not think, however, it would be possible to derive any general conclusions in regard to the behaviour of tanks in this respect from the observations at these three tanks. The rate of silt accumulation depends upon a variety of circumstances, e.g., nature and configuration of the catchment basin, its geological formation, presence or absence of cultivation in the catchment, amount and intensity of rainfall, the arrangements for securing the tank, &c.

AMBAGHERI RESERVOIR (NAGPUR.)

From paragraph 20 of the printed papers relating to the original project, it appears that the greatest depth of silt found in the old native tank, when it was remodelled and improved to form the reservoir for the water-works, was 2' 6", an accumulation of 80 or 90 years, being at the rate of 0.375 inch per annum. Recent investigations, when the tank was nearly dry, show that on the fairly even slopes of the basin, a depth of about 8 inches of silt was deposited in 20 years, or at the rate of 0.4 inch per annum, or practically the same as in the old tank, the extent and nature of the catchment remaining the same. These depths refer to dry silt measured on the dried-up portions of the tank. In 1900, when the water in the reservoir was very low, some 4 millions cubic feet of silt and soil were taken out of this tank by famine labour, and it was then found that the silt, in a dry and consistent enough condition to excavate as ordinary earth, was 8 inches on the level or gentle slopes of the basin.

JUBBULPORE.

This reservoir, since its construction in 1883, has never dried up sufficiently to allow of the silt accumulation being measured as dry or nearly dry soil. Some soundings have recently been taken to ascertain the present bed. Sections have been plotted from these soundings and compared with the original bed. It would appear (1) that the maximum depth of silt, as ascertained by soundings, deposited in the depressions in the basin is 22.58 feet, which gives a maximum rate of 15 inches per annum (for 18 years), and (2) that the average depth over the comparatively even slopes of the basin is only one foot, equal to a rate of 0.66 inch per annum. This is nearly double the rate at Ambajheri which has a comparatively flat basin. I attribute this partly to the fact that a considerable area of the catchment was under cultivation when the reservoir was first constructed, and that the soil washed into the tank during the first year or two, or till grass and scrub was allowed to grow over the whole catchment, was comparatively large in amount compared to what it is now, and that this excess of the first few years is only spread over 18 years in the case of Jubbulpore as against 100 or more years in the case of Ambajheri. It must be remembered too that the silt was measured in the state of more or less liquid mud and not dry.

MOGHAT (KHANDWA).

This tank was constructed in 1897 and has not had time to silt up appreciably. In 1900 when the tank was quite dry with the exception of a small pool in the deepest part, there was not much evidence of silt deposit, except in the bed of the old nala, which had in places (old depressions) 2 or 3 feet of silt. Actual measurements were not taken, and the information is recorded for what it is worth.

1. *Q. (The President.)*—I merely want to ask you a few facts about your relief works programme for the province. Is the programme ready?—Yes.

2. *Q.* I understand that in the recent famines road-metalling was the main work of relief?—We had to depend on that chiefly, because we had no other works to go upon in the year when the famine relief was required.

3. *Q. (Mr. Muir-Mackenzie.)*—Do you mean that no other projects were ready or that there were no projects possible?—They were not ready.

[A statement of proposed works was put in.]

Mr. Muir-Mackenzie.—This is what you have got ready for the next famine?—Yes. That is the programme revised up to date. There are a great many more works in the shape of village tanks for which we have not got details from the Civil Officers.

4. *Q. (The President.)*—You did practically very little tank work in the last famine?—There was a great deal done under the Civil Officers—small tanks.

5. *Q.* The ryots objected to the repair of the tanks?—Some of the owners of the tanks complained that we had ruined them. Sometimes in digging the bottom of the tank and repairing the bund, water finds its way through the porous soil, but the tank puddles itself after a year or so.

6. *Q. (Mr. Muir-Mackenzie.)*—Is it advantageous to repair a tank by taking the earth from the bed?—That is done where you have a broad bottom.

7. *Q.* I understand you to say that the injury done to the tank was due to the taking away of the earth?—Because they took earth from the nearest point, and too near the embankment.

8. *Q.* But you would generally advocate the taking of the earth from a certain point in the tank?—Yes. It would increase the capacity of the tank. But I would not open up a porous stratum of the soil. I would increase the capacity by taking the earth which is above the level of the outlet.

9. *Q.* The advice of the Public Works Department is not taken as to the character of the work to be done by the Civil agency?—No; they carry out their village works and suggest to us what works we should take up.

10. *Q. (The President.)*—What is the distinction drawn between the works under the Public Works Department and those under Civil Officers?—The works under Civil Officers will be the small village tanks that I am referring to.

11. *Q.* These alone?—Any other petty works in the village, such as the banking of fields, &c.

12. *Q.* The distinction is well understood?—Yes. There is no ambiguity about it. Sometimes we take up little works as annexes to our big works if they are at a reasonable distance from where the main relief camp is working.

13. *Q.* I see that in the famine programme for 1901 there is a very large proportion of railways. Are these new lines which are projected?—They are all the lines that the Local Administration has recommended to the Government of India—all the railways advocated in this letter (handing over a letter to the Commission.) We get a report from the Railway Companies concerned if the construction is going on and of the actual earthwork being carried out; and then we reduce our famine programme by that much.

14. Q. Will the famine programme for 1902 be the same as that for 1901?—It will require correction in regard to any works entered in that programme which have been carried out during the year. It will be revised to that extent.

15. Q. You have had no famine in 1901?—No.

16. Q. Do you send a fresh statement at the beginning of each year?—We do correct our famine programme. It was only three years ago that we started them and as soon as they had been put into proper shape another famine occurred. There is work in every district except three.

17. Q. I suppose in these three districts famines are not likely to occur?—Famine relief-works are provided for every district. What I mean is that no irrigation works are provided in these three districts.

18. Q. You correct the programme up to date year by year, making the necessary alterations?—Yes. The programme was revised in 1900 during the famine and the final revision in 1901 brings the programme practically up to date.

19. Q. When will you prepare it for 1902?—We will alter it slightly for 1902.

20. Q. (Mr. Higham.)—Will you explain how you arrive at the number of individuals to be paid by the rupee?—For every rupee spent in direct relief we relieved 11·9 day-units, and for every work costing a rupee under ordinary circumstances by contract, 2·2 rupees was the cost when carried out by famine labour. Multiplying these two together you get 26·3. We have adopted 20 as being the round number and that leaves a margin of 30 per cent. and so our famine programme for earthwork and roads could really be increased by 30 per cent. of the number of day-units.

21. Q. Instead of employing them for 90 days or 3 months you employ them for 4 months?—Yes. The irrigation works and railways which are mentioned are pure items of famine relief works on which famine relief labour could be suitably employed.

22. Q. Dividing the number of day-units by 20 you get the normal value in rupees?—Yes.

23. Q. That being the normal value of the work that could be done by famine labour?—Yes.

24. Q. In the famine programme of 1900 are these worked out in the same way, on the same scale?—For the year 1900 the multiplier taken was 20.

25. Q. You take the same constant?—Yes.

Mr. Muir-Mackenzie.—What is the process you adopt in reckoning up the value of the work; you take the ordinary rates?—Yes, and then multiply it by 20, to ascertain the number of day-units that can be employed.

26. Q. To show the number of units that could be relieved?—Yes, the day-units. If we have got a work costing Rs. 10,000 we spend Rs. 22,000; and for every rupee of these 22,000 we relieve 12 day-units.

Mr. Higham.—In your programme for 1900 you had provided for nearly three times as much labour as actually came to the work?—We had not the programme ready at the beginning of the famine and as the famine was going on we had to revise it.

27. Q. You employed 180 millions in the famine of 1899-1900. What were they employed on chiefly, as divided between roads, railways and irrigation works?—I may say almost entirely on roads. Other works formed a very small proportion of the whole.

28. Q. You began some irrigation works?—We began some, but that was a small fraction of the whole expenditure.

29. Q. You commenced some tanks?—There were some tanks begun in Chhattisgarh.

30. Q. How many?—Thirteen.

31. Q. They are all included in these irrigation projects?—Yes.

32. Q. Have you got a list of these 13?—I have not got it here. It is in Mr. Harriott's irrigation papers.

33. Q. Does he say what was spent on them?—You will find it in his Note on Irrigation in the Central Provinces. We made a compilation of several papers bearing on irrigation up to the time the investigation was started, so as to let the officers know what had been done.

34. Q. You say there are 13 works?—There were 13 tanks altogether on which work was begun.

35. Q. They are in different stages of progress. Have you any statement of expenditure incurred on them?—We have got it. But I am sorry to say I have not got it here.

36. Q. Do you propose to complete them or do you desire to complete any of them.

The President.—They are all private tanks belonging to malguzars?

Mr. Craddock.—Not these.

Witness.—These were all new tanks. Three of these are of Mr. Hutton's and 6 of Mr. P. C. Lal's designing.

Mr. Higham.—What are the proposals in regard to completing these works? Is it desired to complete them or is it proposed to let them stand till the next famine?—We should like to complete some of them, those that we think are fairly protective.

37. Q. Which are they?—That I have not got a statement of. Mr. Harriott had all these papers and he ought to have produced them.

38. Q. (Mr. Higham.)—We should like to know what works have been commenced and are kept standing?—Beltara, Asnidh, and Dulara schemes were sent up to the Government of India for sanction and were returned.

39. Q. What was the expenditure on any one of these?—Something over one lakh and ten thousand.

40. Q. Is it proposed to push on these works and if so what money would you want for them?—I cannot tell you that.

41. Q. Suppose we recommend a commencement being made next year of these irrigation projects that have been proposed, including those particular ones on which famine relief labour was employed, how much would you be able to spend on them?—Do you mean without any increase of establishment?

42. Q. Yes. How much will you be able to spend? three lakhs.

43. Q. Per year?—Yes, and that with difficulty. We should have a certain amount of increased establishment to do that, but only of a subordinate nature.

44. Q. If you are to push them at a greater rate than three lakhs a year, you would require extra establishment?—We would require practically a separate irrigation branch for the province with its own Superintendent of Works or Superintending Engineer.

45. Q. You could not have a Superintendent of Works and a separate establishment unless you have a very large programme of works?—Yes.

46. Q. What do you contemplate—10 or 12 lakhs?—10 lakhs a year.

47. Q. Without a special organization the present establishment could not spend more than 3 lakhs?—That is the limit which we could do, and this would be a great strain on our present staff.

48. Q. You cannot say which work you would recommend being put in hand?—It would cost Rs. 3,65,000 to complete Mr. Lal's six works. We have already spent Rs. 2,15,000 on these six tanks by famine labour.

49. Q. On what works was the biggest expenditure incurred?—On Marowda and Sanjari.

50. Q. On each of them you spent Rs. 90,000?—Yes.

51. Q. That is the value of the work done?—Yes.

52. Q. Did they give employment right through the famine?—Yes, that is from January.

53. Q. Till when?—Till the famine closed. That is till the end of the rains.

Mr. Craddock.—They did not begin till February or March.

Mr. Higham.—How much can you spend on these works in an ordinary famine? What should be the size of the work that would carry you through in a famine. If you had a scheme for 4 or 5 lakh, would it take you through 4 or 5 famines?—2 or 2½ lakhs would carry you through a famine.

54. Q. You cannot employ more than a certain number of people?—We would have 2 or 3 charges if the work extended over a sufficient area. Some of our charges run up to 20,000 if we let them. We split them up into four of our standard charges and there was no room for them to work.

55. Q. That is bound to extend to a large area?—Yes. That is why I put down a 2 lakhs project as a suitable one to complete in a famine.

56. Q. Anything above that will have to be done before or after the famine?—There would not be room enough for labour representing a larger sum to work.

57. Q. A famine project should cost less than 2 lakhs?—Yes, for completion in one famine.

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58. Q. Was famine labour employed on repairing irrigation works?—In Wardha, Hoshangabad, and Betul. They could find something in these districts no doubt, but no projects have been investigated there yet. In Hoshangabad it is a question whether irrigation is possible by canals.

59. Q. Was famine labour employed on repairing irrigation tanks?—Yes.

60. Q. Were any of these completed?—Yes.

61. Q. They were practically village tanks?—Yes.

62. Q. No big tanks?—No.

63. Q. (Mr. Muir-Mackenzie.)—Were they irrigation tanks or water-supply tanks?—All are more or less irrigation tanks.

64. Q. (Mr. Higham.)—Do you know how much the tanks belonging to private individuals irrigate?—No.

65. Q. I understood from you that the village tanks that were repaired were for providing water to cattle and men and not for irrigating purposes?—They are not large works, but very small works irrigating a few acres.

66. Q. Is there any possibility of employing relief labour very largely on improving and repairing the old existing tanks?—Yes.

67. Q. Have they any place in your programme?—There are a few left over from the last famine. We are trusting to Civil Officers for a list of all the tanks they want included.

68. Q. Have you got that list?—Not yet. It must be received during the hot weather.

69. Q. Is the copy of the programme of the works that you put incomplete for the present?—As far as we know all works fit for famine are included in it. If the Civil Officers would tell us what works they want they will be put in the programme. Small village tanks are entered for village relief.

70. Q. They will all be under Civil Officers?—Yes.

71. Q. What was the number of irrigation works taken up during the last famine which remained incomplete and what sum will be required to complete them?—There were ten large irrigation tanks taken up in the last famine. Rs. 2,66,000 was the actual value of the work done on them, and Rs. 6,71,000 are required to complete them.

72. Q. (Mr. Muir-Mackenzie.)—Would you kindly explain to me how the programme is prepared? First of all you send a list of your proposals to the Public Works Department through the Executive Engineer and to Collectors, and the Collectors add in the list of village works that are required and the whole thing comes up to you?—The road part is prepared in the office from papers connected with road scheme. That is merely a matter of compilation in the office. Then the village tanks will be filled in from the list supplied by the Collector. We have not got this yet.

73. Q. Does the Collector approve of works from your road schemes?—We put in every possible work that can be done so as to cover the greatest area.

74. Q. Does he not point out, for instance, that such and such an area is not sufficiently served?—They have in one or two instances.

75. Q. Does it go to them? Are they consulted in order that they may point any deficiencies? Not before it is issued. It contains everything that we can suggest and when it is issued, it is open to the Commissioner or to the Deputy Commissioner to point out certain areas not protected by relief works.

76. Q. You consider that the scheme as it is results in a district being sufficiently provided with works distributed over it in such a way as to serve every portion?—I do not say that. They are not complete till we can get some more irrigation works both large projects and small works such as village tanks, &c.

77. Q. In order to complete the list of irrigation works you require village tanks?—Yes. There is no other work that we can provide for. We have more roads than we want.

78. Q. You are preparing new tank projects?—Yes.

79. Q. For village works you will depend upon the Collector?—For small tanks.

80. Q. Do you think that it would not be good to have a survey made and see what ought to be done with regard to village tanks?—Yes, if it is a new tank.

81. Q. With regard to old tanks would it not be advisable for the Public Works Department officers to advise on the tank generally as to the desirability of raising its bund, and giving it any waste-weirs and

sluices at the same time as you undertake famine relief works?—Yes; most decidedly. We work up to that end. At present we take up large projects which would employ a large number of workers, but later, when we have establishment available, we will take up the question of small tanks.

82. Q. (Mr. Higham.)—Mr. Morley told us that there were a number of tanks which did not hold water and that their bunds were not high enough?—As soon as we get a list of these tanks we must go and examine them. At present we do not know where they are. If there are any suggestions from the Collectors as to possible improvements, the Public Works Department would send out a man and see what could be done and do a certain amount of surveying.

83. Q. (Mr. Muir-Mackenzie.)—What standard do you work to in preparing a famine programme? Do you take a certain percentage of the population or do you take the same percentage of the population as relief was provided for at the last famine?—We have taken up every work that we could take for famine relief.

84. Q. You have stated how many people you could provide for?—Yes. In many cases half the population and sometimes more even.

85. Q. Your programme is not complete till it does provide for a certain percentage of the population?—Yes.

86. Q. In Madras, for instance, the standing order is that the programme should include works sufficient to provide employment for 20 per cent. of the population in every district. You have not a standing order similar to that. I do not suggest that you should have as much as 20 per cent. It might be necessary to provide for more than 20 per cent. in a particular village. Is there any percentage fixed?—There is no percentage fixed.

Mr. Craddock.—It is not done in the Public Works Department but in the Revenue Department. Recently the Government of India wished to know the maximum number that could be relieved under our famine programme.

87. Q. (Mr. Muir-Mackenzie.)—Do not orders go to somebody to see that famine programmes are made up to a certain limit.

Mr. Craddock.—They used to, but it was discontinued during the last famine, because it was opposed to all experience.

88. Q. (Mr. Muir-Mackenzie.)—At any rate, you would feel that no future programme would be sufficient unless it provided for at least as large a percentage of the population as you employed in the last famine, unless the place is more efficiently protected. In the Chhattisgarh Division and the Wainganga valley, there is room for a great many more tanks. Are there any other irrigation works for which provision is made in other Divisions?—We have got no irrigation works in the other Divisions except Mr. Harriott's projects.

89. Q. Except those projects there are no irrigation works—no small village tanks?—There are plenty of these.

90. Q. In the Nerbudda Division?—Yes.

91. Q. Are they for irrigation?—No.

92. Q. They are for water-supply?—Yes.

93. Q. Is there any field embanking in the programme?—No.

94. Q. Would you say that they should be in the programme?—Yes, decidedly.

95. Q. Also the bunding up of nallas?—That would be a suitable work for village relief.

96. Q. Do you think any good could be done by the Public Works Department giving advice as to the best method of constructing these bunds and giving their professional and technical advice as to plans and estimates beforehand?—I understand that people know much more of such matters connected with cultivation than the officers of the Public Works Department.

97. Q. You don't think it would be of any good?—No.

98. Q. We have heard that some advice would be necessary in the case of bunds?—If you give them the line showing where to put the bunds, that will go enough.

99. Q. (Mr. Higham.)—Very often they do not make proper arrangements for waste and the bund breaks?—It would be a good thing to give them some assistance.

100. Q. (Mr. Muir-Mackenzie).—What do you look upon as the best kind of work for famine relief?—Metal-breaking is very good.

101. Q. I mean from the point of view of utility. What is the best in the matter of management, getting good task, and of discipline?—I should say earth-work on the whole. As to metal-breaking we had a lot of trouble in the last famine. In this part of the country we can never get two blocks of stone exactly of the same kind.

102. Q. Did you find that a great deal of metal work that had been done was thrown away or wasted? A good deal of it was wasted, because it was done upon roads which we cannot metal and maintain as metalled roads owing to financial reasons.

103. Q. Relief labour could not have spread the metal?—They could not have consolidated it.

104. Q. Would it not have been a trifling addition to cost to have consolidated it?—It is not only the cost of actually putting it down, but the cost of maintaining it, that was the difficulty.

105. Q. If you put down the metal and spread it, would you not get an uncommon good road?—Not by famine labour. We have ruined some good second class roads by trying to convert them into first class roads by famine labour.

106. Q. A Superintending Engineer in Madras said that he got excellent roads for five years by utilizing famine relief labour for not only breaking metal but for spreading and consolidating it. The usual thing in the Bombay Presidency is to break metal?—Famine labourers can spread the metal, but spreading and consolidating are two different things. If you can give them heavy rollers and make them drag them by turning them into bullocks, it could be done. Most of the consolidation that we attempted here was without rollers. It was simply done with rammers, but that was an absolute failure. I have no doubt that if you have rollers and utilize coolies instead of bullocks it would be all right. But rollers and plenty of water are essential.

107. Q. Do you enter works which it is proposed to complete by ordinary labour? I understand you enter all the roads you want and if any of them is completed by ordinary labour you strike it off from the list?—Yes, at the time of revision.

108. Q. What is the date of revision?—If no famine intervenes it would be every year.

109. Q. When?—Every April.

110. Q. You revise it in April so as to be ready if a famine should occur in October next?—Yes.

111. Q. Was the idea ever started in this province of digging *kacha* wells by famine labour?—Not by the Public Works Department.

Mr. Craddock.—In some villages they did not get water till they started digging these wells?—The Public Works Department dug a number of wells for water-supply to labourers.

Mr. Muir-Mackenzie.—How were they dug?—By famine labour, and a good deal by outside labour. It was done by contract. We are obliged to have wells before we can employ coolies in large numbers, and the water-supply of a camp had to be assured before the camp was opened.

112. Q. Had you to dig many wells in Chhattisgarh before you employed coolies?—Yes.

113. Q. Was the water very deep?—It is very difficult to say. We always went to the bed of a *nalla* if we could.

114. Q. Did you go to the bed of a *nalla* or to the bank?—Generally to the edge of the bank.

115. Q. Did you do any blasting?—No.

116. Q. Did you find that the people of Chhattisgarh showed any repugnance to drinking well water?—No.

117. Q. Do you think that in a country where very few wells are at present dug, you could manage to irrigate purposes?—You could not employ a large employ famine labour profitably by digging wells for amount of labour. I am speaking from the point of view of a Public Works Department Officer.

118. Q. You have nothing to do with village works and so you cannot give an opinion as to what is best for villages?—No.

Mr. Rajaratna Mudaliar.—What is the objection to employ cattle in times of famine in dragging rollers for the consolidating of roads?—What would the relief workers do?

119. Q. They will be employed in breaking metal, spreading it, and in bringing water. Owners of cattle also suffer very much?—The water that you pour on the road evaporates very rapidly, and this consolidation could only be done in the rains. In the hot weather during the last famine we could in most places only obtain enough water for drinking purposes and that with difficulty.

120. Q. There is no serious objection, if water is available?—If we had plenty of water so that we could have our roads soaked while consolidation is going on and if we had rollers, we could do some consolidation. But, at the same time, I would not advocate it even with rollers in dry weather. If there is rain I would.

121. Q. You have given only the number of day-units in the statement?—I suppose you have details of the statement to show how you arrive at this number.

[Witness here handed in a statement giving the details.]

122. Q. From the estimate of cost, you arrive at the number of units?—Yes, at 20 to the rupee.

123. Q. The statement does not show the number of works, the quantity and the cost of the units?—This abstract was got ready in a few minutes.

124. Q. Does the entry under village tanks include repairs to tanks?—These entries are nothing, because there are only one or two tanks brought over from the programme of the last famine. We are waiting for a fresh list from the Deputy Commissioners.

125. Q. They do not include repairs to works belonging to *malguzars*?—One or two of them are included.

126. Q. Does the provision for irrigation works include all new projects?—These are all new irrigation projects in the statement.

127. Q. Are the estimates ready for the whole of these? Yes, good enough to start work on.

128. Q. Can you say what proportion of population this statement provides relief for in each district?—I have not had time to work that out.

Mr. Craddock.—They will provide for much more when you get the list of village works?—Even as they stand, they provide for four or five times the number that were employed in the last famine.

Mr. Muir-Mackenzie.—You provide for considerably more than 100 per cent. in certain parts?—In the Balaghat district we provide for more than the whole population for three months.

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7 Mar. 02.

FIFTY-FIFTH DAY.

Raipur, 10th March 1902.

WITNESS No. 16.—Mr. P. C. LALL, Offg. Executive Engineer, Raipur.
Replies to printed questions.

A.—GENERAL.

1. Q. The answers below refer generally to the three Chhattisgarh districts of (1) Raipur, (2) Bilaspur, (3) Sambalpur, and particularly to the Raipur district, in which I have served during the last two famines of 1896-97 and 1899-1900. From January 1901

to April 1901 I have been specially employed on the preparation of five irrigation tank projects in detail, all in the Drug tahsil. Since last May I have held charge of the Public Works Department, Eastern Division, comprising the districts of Raipur, Bilaspur, and Sambalpur, and have investigated about 60 new projects in the Division.

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some of the sites. During these investigations I have had opportunities for observing as well as for collecting information about a few important points in connection with the subject of irrigation.

2. Q. The average rainfall of 33 years (1867 to 1899) in each month of the year for the three districts is given in the accompanying table.

Average rainfall of 33 years from 1867 to 1899 in each month of the year for the three districts.

District.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.
Baipur.	8.52	14.80	11.82	7.12	1.63	0.42	0.18	0.26	0.34	0.44	0.50	0.75
Bilaspur.	8.23	14.51	12.58	7.44	1.62	0.37	0.20	0.59	0.43	0.80	0.57	0.79
Sambalpur.	9.55	18.04	14.17	7.93	1.88	0.48	0.21	0.56	0.37	0.72	0.41	1.13

3. Q. There is no obstacle to the extension or rather the introduction of irrigation in tracts where irrigation schemes are possible.

(1) But it so happens that where there is little or no cultivation many such schemes are available, whereas in the more densely populated and cultivated tracts, the scope for such projects is limited.

(2) I am informed that the average plough cattle is not sufficiently strong for the more laborious cultivation of transplanted rice. It is, however, sufficiently well suited for the broad-casted rice cultivation. Irrigation will tend to lessen its labour in the cultivation of the latter species of rice, but if transplanted rice is substituted, a better class of cattle may be found necessary.

(3) I am informed that three cart loads of manure are used for one acre of inferior matasi or dorsa soils and two for the better soils, and that if only irrigated but not manured at all, the same soil would give a reduced yield. What would be the normal producing power of the soil under irrigation only cannot be correctly ascertained, as, under the existing conditions, a field is manured at least once in three years. Even black-soil fields are manured with "laddea" (silt of tanks), ashes, cowdung and leaves, &c., but although the use of manure doubtless increases the yield it is not essential for rice cultivation. Insufficiency of manure would not therefore cause any obstruction to the extension of irrigation.

(4) I think the rice cultivated in black-cotton soil fields situated in low valleys ("baharas" or "bahals") does not need irrigation, except in years of scanty rainfall and drought. By scanty rainfall I mean an amount less than 36 inches. Drought is only a comparative term. A year, such as 1867-68, with a rainfall of say 20 inches, would be considered a very dry year. Being retentive of moisture and owing to the increased moisture by sub-soil percolation from the matasi and bhata fields on the upper slopes, rice fields situated in low valleys require very little September and October rain in normal years to yield a bumper crop. Excessive supply of water weakens the rice weed in black soil, which needs a full 6-inch watering once in 15 to 20 days. In normal years irrigation applied to such lands would, if anything, do more harm than good.

(5) Irrigation from tanks has not been and will not be obstructed owing to the uncertainty of the supply of water. As a rule the rainfall is abundant. All storage reservoirs having sufficiently large catchment areas would fill even if the rainfall is scanty. But the irrigation which is directly dependent for its supply on the streams is, and will be, obstructed by the too early cessation of rain. In the year 1899 all, except the largest, streams dried up in November, and the supply during September and October was not more than one-fourth the normal. The supply in the Mahanuddy river at Rajim was then not more than a third of the normal. The too late commencement of rain does no harm to the crops, except that re-sowing is done in places where early sowing, helped by one or two light showers of rain ("Chota barsat"), results in germination, but dries up before the monsoon sets in properly.

(6) This is certainly one of the reasons why irrigation, even where it could be most advantageously and economically applied, has not been introduced. Tenants and malguzars are too poor to undertake any irrigation works, even if they combine to do so. Without the aid of Government nothing can be done, and yet whatever old tanks exist have been built by private individuals and malguzars. The majority of these tanks, however, have been constructed for water

supply for men and cattle. A tank is rarely used solely for irrigation. In course of time the bunds of some of the tanks have been raised, and the few additional feet depth of water stored in a year of ample rainfall, such as in 1896-97, is utilized for one or two waterings in the event of the failure of rain at the critical time. I think funds for the expensive cultivation of the more valuable crops, such as transplanted rice and sugarcane, are generally wanting.

(7) This is also a potent factor in discouraging irrigation. In one instance I am informed sugarcane cultivation below a tank has been abandoned in the hope that at the next settlement only the usual wet rate for rice land may be assessed. In bhata and matasi villages, situated on the higher ridges of the country, the malguzars fear that rent will be enhanced for irrigation to an extent incommensurate with the benefits that may be gained. In villages where dorsa and kanhar soils predominate and the matasi fields are even and well embanked, the announcement regarding the introduction of irrigation is cheerfully received; and the suggestion that as high a rate as Rs. 2 to Rs. 3 per acre may be charged by Government is acquiesced in.

(9) I think the existing system of scattered holdings of tenants and malguzars will somewhat obstruct the extension of irrigation. I understand concentrated attention in the cultivation of the better species of irrigated rice is possible only "chakbandhaies." Scattered holdings mean so much more labour, and therefore expense.

5. Q. Loans are not freely taken under the Land Improvement Act for the extension of irrigation or for the improvement of the fields, because the condition and terms under which such loans are granted are not generally understood, and there is a certain amount of trouble and expense in obtaining them under the existing arrangement. I would suggest that steps be taken to make the conditions widely known and understood, and that the services of the Revenue and other officers, when on tour in the camping season, be utilized for granting such loans through the malguzars, after personal enquiry on the spot. It should be ascertained that the improvement is really necessary and the work for which the loan is applied for is practicable and can be carried out without any skilled labour under professional supervision.

(1 & 2) Entire remission of the interest is not desirable, but the rate of interest may be reduced.

(4) I would recommend total remission of the advance in cases where the person concerned is obviously not responsible for the failure of the attempt to obtain water, and has applied the whole advance to the object for which it is taken.

(5) The principal thing to encourage the loan is to make the conditions of its repayment by instalments less stringent than now observed in practice. The repayment should not commence until the improvement has actually resulted in profit, and this has been established after personal examination by a responsible officer.

Although the existing rules, I understand, permit of the period of repayment being extended to 20 years, in practice the recovery of the advance begins soon after the work is completed, and the instalments are so fixed as to complete the recovery in 3 to 4 years. If the repayment covers a period of 10 years for small advances, say up to Rs. 200 for small tenants with holding of 10 acres or less and 20 years for larger advances, and the first instalment is realized in the third or fourth year after the completion of the work and these terms are made known to all concerned, I believe loans will be freely taken for the extension of irrigation.

(6) I would not recommend grants-in-aid, but partial or even total remission of the advance might be made in the case of the poorer tenants and malguzars who, after due enquiry, are found to be incapable of repaying the same without borrowing at a high rate of interest, and in the case of those who, on account of circumstances over which they have no control, have lost all credit and can no-wise repay the advance.

6. Q. There are no regularly irrigated tracts which could attract cultivators from unirrigated areas, but it is feared that the introduction of irrigation in certain tracts may draw cultivators from the adjacent unirrigated tracts. But should this happen, it will help to stimulate the extension of irrigation, and the value of irrigable land will rise.

The past two famines and the last year's insufficient September and October rainfall, which has necessitated

tank irrigation resulting in considerable benefit, has convinced the people of the great utility of irrigation tanks. In one instance a tank, which was constructed during the last famine, submerged some cultivated land. The owners applied for compensation of damages sustained and claimed Rs. 300. The Tahsildar was deputed to report in the matter and to realize the amount claimed from the malguzars and to other tenants who had benefited the tank.

The money was been promptly and gladly subscribed and the amount paid to the owners of the land. The area irrigated was about 600 acres, and a thin watering of 2 inches to 3 inches only was given. I have observed the Chhattisgarh Kisan actually baling water from deep roadside borrow pits to irrigate the withering rice crop. In the rice tracts of Chhattisgarh, especially in the Raipur and Bilaspur districts, the desire for the extension of tank irrigation has never been so marked as it is now.

C.—CANALS OF INTERMITTENT FLOW.

12. Q. (1) Small irrigation channels or tars supplied from streams across which temporary dams are constructed with boulders and earth are to be found in Raipur and Sambalpur districts. Nallas with small drainage areas are thus utilized.

(2) If the contour of the land to be irrigated permits it, the water is distributed for irrigation direct through the channel, otherwise the supply is stored in tanks which are filled when required.

(3) (a) In a year of ample rainfall, the supply in the stream usually last for at least a month after the rains cease, and throughout the rains even, when there is a break of 10 or 15 days in the monsoon. During such breaks the highlying fields in bhata-matasi soil need water which is drawn direct from the stream. In the event of September and October rainfall being deficient, the supply is maintained up to about the middle of October.

(b) In a year of scanty rainfall, the flow in such nallas ceases earlier, about 15 days after the last fall of rain, and the supply is therefore insufficient to give the full amount of water needed. In the case of the tar at Nandkhati the nalla has a drainage area of about three square miles at the side of the bund. The length of the irrigation channel, which has been cut through a bhata ridge before it gains the matasi slope on which the Nandkhati village is situated, is about two miles. The tar is used for direct irrigation and also for stocking an old tank at Nandkhati, whose irri-gable capacity is about three to four millions cubic feet. During the monsoon of 1899 the rainfall at Drug, which is 12 miles south of Nandkhati, was 38.41 inches. The flow in the nalla ceased about the end of September, and the supply maintained up to that period was scanty. All fields usually irrigated by this system got water, but it was not sufficient. The tank also could not be filled.

(c) In a year of drought, such as 1867-68, I do not think any streams, except a few, which in a normal year keep flowing till late in April, could maintain any supply for irrigation in September and October. In an average year the rainfall up to about the middle of July is just sufficient to saturate the ground, but the quantity absorbed is not sufficient to raise the sub-soil level of water much by percolation.

I should say rainfall, amounting to less than 20 inches, would have no effect in inducing sub-soil percolation, which would result in an ordinary stream of, say, 10 to 20 square miles drainage area, flowing even a day after the actual flood, due to the off-flow from the catchment area, is discharged. I therefore consider that no irrigation channels drawing their supply from any but the largest streams could be relied upon for irrigation in a year of drought. They would fail as soon as the last drop of rain has fallen.

D.—TANKS.

23. Q. (1) Tanks are, as a rule, supplied with rain water which runs off their catchment areas. Occasionally a contour drain is constructed to lead the off-flow from a separate ground into the tank whose own catchment area is insufficient to yield the requisite supply. Sometimes a nalla is dammed and the supply is diverted into the tank. Such instances are rare. Most tanks are situated on sloping plains high up the valleys. Some are constructed by bunding up small nallas. With few exceptions tanks have been dug out, and the earth used for the bund on three sides, the open side facing the sloping catchment above. The depth of the supply stored, which can be utilized for irrigation, seldom exceeds 4 to 5 feet in a year of ample rainfall.

(2) The bund of the tank is cut through at one or both flanks, and about 1½ to 2 feet depth of water is drawn off and led through simple earthen channels to the fields below. The supply is distributed from field to field. If the tank still contains more than what is sufficient for drinking supply, a second breach is made in the bund at a lower level and another 1½ to 2 feet depth of water is drawn off and utilized in the same way. More than 4 to 5 feet depth of water from a tank is seldom used for irrigation.

(3) (a) With ample rain the existing tanks fill and the supply available for irrigation is maintained up to March or April. In the event of the rainfall in September and October being insufficient or untimely, one or two waterings of three inches to four inches are given to the area irrigated from the tanks.

(b) In a year of scanty rainfall the tanks do not fill, and the supply available for irrigation is practically nil. Whatever supply is stored is barely sufficient for drinking water for men and cattle.

(c) In a year of drought, such as the year 1867-68, I do not think any of the existing tanks would have any supply in them, even for drinking, which could last until March. All of course depends on the catchment area and the size of the tank compared with the yield available in a year of drought. In the year 1899 not a single tank filled to its normal high-water level. More than 60 per cent. dried up by the end of October. Roughly I should say 30 per cent. held out till the end of January, and about 10 per cent. had a few feet of muddy water in them in April.

It may be noted that the necessity of keeping water-supply in the tanks for drinking purposes was considered by many malguzars as the most urgent, and with rare exceptions the tanks were not drawn upon for irrigation.

(4) The capacity of a tank varies widely. It may be anything between one-fourth million cubic feet and 15 million cubic feet, which I believe is the maximum for any tank in Chhattisgarh. The majority of the tanks in Raipur are small, and hold about half million cubic feet of water available for irrigation in a normal year. The area irrigated depends on the quantity of water used. If one watering is given, which is usually the case, the area irrigated from a tank is about 15 to 20 acres. In the year 1896 all tanks filled; but rain practically ceased from about the middle of August. The rainfall was above the normal. The quantity of water used for irrigating one acre varied from 30,000 to 35,000 cubic feet. This was distributed in two waterings.

24. Q. This question, so far as Chhattisgarh is concerned, cannot be answered except in a most general manner. Each tract and in fact each village area must be separately dealt with. There are so many indefinite factors to determine the yield. Even in the same kind of soil and under exactly the same conditions of irrigation, situation of the fields, &c., the yield may be different. But considering separately the various soils I would answer as follows:—

(1) Cultivated rice land generally consists of (1) bhata-matasi soil, (2) matasi, (3) dorsa soil, and (4) black cotton soil. There are, I believe, many villages with cultivated areas in soils (1) and (2) only, and many others which have soils (3) and (4), and others again which have all the four kinds of rice soils. Soils (1) and (2), as generally known and classified, are not double-cropped, nor can they be double-cropped. The best matasi soil is said to be capable of growing tilli, rahar, &c., if irrigated; but I am doubtful on this point. If attempted, success may follow; but it is uncertain. I am therefore of opinion that there would be practically no increase in the produce of bhata-matasi and matasi lands due to the cultivation of two harvests instead of one. But dorsa and kanhar fields, even where they are at present unembanked, and are situated on ridges or on sloping planes along the banks of the streams, and are cultivated with kodo and rahar, &c., as a single crop, will, under irrigation, admit of a second "utera" crop being sown in September and October. What percentage of the dorsa and kanhar areas, on which at present only a single harvest is cultivated, will be double-cropped cannot be determined; but I am informed that if irrigation is introduced, such fields would be embanked and would certainly produce two crops instead of one. At any rate the maximum area now cultivated with double harvest in a year of ample and seasonable rainfall will be maintained. Taking the average of this second crop for, say, 10 years to be about half of the full yield, I estimate the average yearly increase in the produce of the dorsa and kanhar areas due to the second

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autumn harvest being cultivated with irrigation as under:—

	lbs.
Urud and masur, half of the full yield per acre	60
Linseed do. do. do.	50
Lakhri and batoora	100

The extra profit in each case would be about Rs. 2 per acre.

(2) The best matasi and dorsa soils if irrigated and manured would grow sugarcane. But the substitution of this valuable crop for rice will not be effected for some time to come. Its introduction will be gradual and its replacing rice area to any appreciable extent will depend upon the issues involved in questions other than irrigation. Better varieties of rice than are now cultivated will no doubt be substituted in all the different soils. I estimate the increase in the yield due to this improvement as under:—

Nature of soil.	Net increased yield in lbs. per acre of clean rice.	Net profits.
Bhata-matasi area	lbs. 130	Rs. 4, middling rice.
Matasi area	110	Rs. 4, best species of rice.
Dorsa-kanhar or (black cotton soil areas.)	80	Rs. 1.

(3) But even with irrigation the yield from the various soils will be different. So far as I have been able to ascertain, irrigation will ensure a bumper crop every year. By a bumper crop I mean one that would be obtained in a year of ample and seasonable rainfall continued up to the middle of October. Such years of plenty do not come round more than once in 10 years or so. In such seasons 7 'khandis' sown have yielded 7 garas (1 gara=20 khandis) of Gurmatia dhan from matasi, dorsa, and kanhar areas; 13 khandis sown in matasi and dorsa fields have yielded 8 garas of Ardhana dhan; and 10 khandis sown in bhata-matasi and matasi fields have yielded 4 carts of Haroona dhan. These results are equivalent to a net produce of about 800 lbs. per acre of Haroona dhan (inferior unhusked rice), 1,400 lbs. per acre of Ardhana (middling unhusked rice), and 2,100 lbs. per acre of Maidhan (best unhusked rice.)

(3) (a) It is difficult to say what increase of yield there would be, due to irrigation, in a year of ample rainfall, as the failure of rain in September results in the total failure of the rice crop; whereas, if there is ample and seasonable rainfall, no irrigation is in my opinion needed.

(b) Rainfall less than a certain amount is not sufficient, however seasonable and properly distributed, even for the lighter species of rice which is reaped in September. If, therefore, scanty rainfall is less than this amount, there is bound to be a total failure of all the rice crop, and irrigation in such years would still result in bumper crop. Similarly, in a year of drought.

Assuming that a bumper crop is represented by 20 annas, and this is possible in a year of ample and seasonable rainfall, the average of 10 years under the conditions of rainfall that have obtained during the cycle—1889 to 1898—may be taken at 12 annas.

So far as I have been able to ascertain, irrigation will do no more than ensure a full 20 annas crop every year. The average annual increase in produce would thus be $\frac{1}{10}$ or $\frac{1}{5}$ of the full yield. In bhata-matasi soil this would be equivalent to $\frac{1}{5} \times 800 = 320$ lbs. unhusked rice=128 lbs. of cleaned rice. In matasi soil the increase is $\frac{1}{5} \times \frac{2,100+1,400}{2} = 700$ lbs.=280 lbs.

cleaned rice. In dorsa and kanhar soils the increase would be $\frac{1}{5} \times 2,100 = 840$ lbs. unhusked rice=336 lbs. of cleaned rice.

25. Q. (1 & 2) The value of the irrigation from the existing tanks is not effected by the late commencement of rain, as tank water is not used for sowings which are done later or re-done when the rains set in well. But should the young crops of the early sowings need water to save it from drying up, the existing tanks, being then at their lowest levels, could not possibly be of any good. The value of the tanks is not diminished, but is considerably enhanced by the too early cessation of rain. The value of the irrigation that may be introduced by the construction of new storage tanks, &c., will increase or diminish generally as full or partial supply is available from such tanks in those years in which rain ceases before September.

26. Q. The irrigation from tanks is not supplemented by irrigation from wells.

27. Q. I estimate the increase in the total annual value of the produce per acre due to irrigation as detailed below.

(1 & 2) These figures exclude the cost of irrigation which is small.

On the average of a normal term of years:—

Nature of rice soil.	Increase due to double cropping.	Increase due to improvement in cropping.	Increase due to irrigation.	TOTAL.
Bhata-matasi	Rs. 4	Rs. 4	Rs. 4	Rs. 12
Matasi	4	4	10	18
Dorsa and kanhar	2	1	12	15

In the year of drought:—

Nature of rice soil.	Increase due to double cropping.	Increase due to improvement in cropping.	Increase due to irrigation.	TOTAL.
Bhata-matasi	Rs. 4	Rs. 4	Rs. 10	Rs. 18
Matasi	4	4	25	33
Dorsa and kanhar	4	1	30	35

29. Q. Practically no expenditure is necessary to bring the water to the field. If the tank is the malguzar's property and his fields are situated below it, he irrigates them fully and passes on the supply to the fields lower down. The holder of the fields has to arrange to convey the supply.

31. Q. The distribution in such cases is regulated by private agreement. Scarcely any trouble has arisen in this respect.

32. Q. The construction of irrigation tanks by private persons should, in my opinion, be encouraged as much as possible by advances being given on the easiest terms possible, and free professional State advice when necessary.

33. Q. Very little inconvenience is experienced by tanks silting up. The process of silting is very slow and depends greatly on the lie of the catchment area and the nature of soil, &c. During the first 2 or 3 years the silt deposited in the lowest basin of a tank is as much as 3 inches to 4 inches per annum. The deposit of silt may be taken to be about 1 inch on the average per annum. Several tanks have been cleared of silt during the last famine. No statistics have been collected, but in no case has the depth of silt removed exceeded 3 to 6 feet. Many of these tanks are old, and have, so far as is known, not been once cleared out since they were first constructed.

1. Q. (President.)—You are the Executive Engineer of this Division, I understand?—I am the Assistant Engineer in charge of the Division.

2. Q. Have you been here long?—I took charge of the Division in May last and have held it since.

3. Q. Where were you before?—I was in this district during the famine.

4. Q. As Assistant Engineer?—Yes.

5. Q. Were you here in both the famines?—Yes, in the famine of 1896-97 and also in the famine of 1899-1900.

6. Q. I suppose the second one was the worst of the two?—Yes.

7. Q. In answer to paragraph 5 of Question 3 you speak about the discharge of the river and say that "in the year 1899 all, except the largest, streams dried up in November, and the supply during September and October was not more than one-fourth the normal. The supply in the Mahanadi river at Rajim was then not more than a third of the normal." Have you got discharges of these rivers?—I have taken the discharges roughly.

8. Q. How do you mean roughly?—I took the discharges with surface floats.

9. Q. After taking cross-section?—Yes, roughly.

10. Q. Is the cross-section difficult to deal with? No.

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11. Q. You have been in the habit of measuring these discharges periodically?—No. In the case of large rivers, in the famine year, I observed the discharge flowing in certain rivers for the sake of the water-supply of our camps. I had to find out what water-supply existed in the different rivers and that led me to take rough observations of some of the rivers and streams.

12. Q. Are there any gauges kept on these rivers?—No.

13. Q. You have only a very rough idea of their discharges?—Yes.

14. Q. About how much water is there in the Mahanadi?—Twenty cusecs.

15. Q. (Mr. Higham.)—At what time?—I took observations a couple of days ago.

16. Q. (The President.)—Does the Mahanadi ever dry up altogether?—Not at Rajim, where there is a trickle left, but higher up, the river dries up altogether in May.

17. Q. I suppose that is the largest river in these parts?—Yes. If I may be allowed I would like to point out one thing more—that 28 miles lower down near Arang, where the bed is rocky and the subsoil flow in the river being obstructed comes up the surface—the discharge is a good deal more.

18. Q. Is there any Sub-Overseer at Arang?—Yes.

19. Q. Could you get a gauge put up and have the discharges recorded? I think this very advisable?—Yes.

20. Q. In reply to paragraph 7 of Question 3 you say that the fear of enhancement of rent is a potent factor in discouraging irrigation and you give an example: "In one instance I am informed sugarcane cultivation below a tank has been abandoned in the hope that at the next settlement only the usual wet rate for rice land may be assessed." Is higher assessment levied on land that is said to bear sugarcane?—(Mr. Craddock.)—Yes. It will be at the next settlement. The settlement going on now has been postponed over a part of the district.

21. Q. You say in reply to paragraph 5 of Question 5, "Although the existing rules, I understand, permit of the period of repayment being extended to 20 years, in practice the recovery of the advance begins soon after the work is completed, and the instalments are so fixed as to complete the recovery in 3 to 4 years." Is that the custom here?—That is what I have gathered from cultivators and from one or two other people of whom I enquired.

22. Q. What is the work—generally improvement of tanks?—I refer to agricultural loans for the purchase of seed and cattle. Even with regard to land improvement loans, I understand it is the same.

23. Q. Have you asked any Revenue authorities whether it is the case that recoveries are made rapidly within two or three years?—Yes.

24. Q. Do they say it is so?—One officer of the Settlement Department told me it is the general practice here.

Mr. Craddock.—I do not know what the practice here is. But that is not according to rules.

25. Q. (Mr. Muir-Mackenzie.)—This recovery in two or three years—is it of land improvement loans or only of loans for the purchase of seed and cattle?—I should say both.

26. Q. You are not quite certain?—I am not quite certain.

27. Q. (The President.)—You say in reply to paragraph 3 of Question 23, "With ample rain the existing tanks fill and the supply available for irrigation is maintained up to March or April." I observed yesterday that there was a good deal of water in the tanks near here?—Yes.

28. Q. What good is that water doing, besides being used by men and cattle? Are there no crops being irrigated now?—No.

29. Q. There will be no irrigation till the next monsoon?—Practically none.

30. Q. Is the water just allowed to evaporate and disappear?—I am afraid so. Beyond what is allowed for men and cattle, the rest will evaporate. These tanks are, as a rule, dug out of the ground, the bottom of the tanks being some feet below the level of the surrounding cultivation so that a certain quantity of water cannot be utilised for irrigation without pumping.

31. Q. Have the tanks in general got sluices?—No.

32. Q. Are the bunds cut every year, or are they merely percolation tanks?—Generally they are percolation tanks. It is only in September and October when the rainfall is deficient or untimely that a breach is made in the bund and two or three feet depth of water is drawn from the tank. The tanks are usually not deep and six or eight feet water is allowed to remain in them for the use of men and cattle.

33. Q. Do the cultivators ever grow irrigated second crops?—What they call the utera crop, e. g., urad, &c., is sown about the end of August, when the inferior rice is being harvested.

34. Q. Is it on the ground now?—No. I believe it has been cut.

35. Q. Do they grow juar?—Not much.

36. Q. Cotton?—Very little.

37. Q. No kharif crop except rice?—Nothing but rice, kodon, and kutki.

38. Q. There are, I suppose, wells in all the villages?—Not in all. Some villages have no wells.

39. Q. Is the water very deep below the surface?—Not in September and October. In the hot-weather it is low, about 40 to 50 feet in some places; but in September and October water level rises to within 4 or 5 feet of the ground surface.

40. Q. You have prepared a number of schemes?—Yes.

41. Q. How many?—I have prepared 5 or 6 in detail, but I have sent up 57 rough projects.

42. Q. Since when have you done this?—Since last May.

43. Q. You have been working hard. Are these all for tanks?—Tanks, and intermittent canals which we call tars.

44. Q. These tars are canals connecting some nalla with the tank. Are they not?—Not necessarily. As a rule they are not. They are meant to irrigate when there is a break in the rains.

45. Q. Chiefly in September or October?—Yes.

46. Q. Are they on a very small scale?—Yes; the maximum irrigation would be about 200 acres?

47. Q. They put a temporary bund across the stream?—Yes.

Mr. Muir-Mackenzie.—Mr. Blenkinsop says that he knows of two pakka ones.

48. Q. (The President.)—With regard to these projects of yours, supposing it is desirable to carry one into execution as soon as possible—some project on a large scale to do good to Raipur—which would you recommend?—I can recommend two projects, viz. (1) Marowda and (2) Khapri Aranda.

49. Q. (Mr. Muir-Mackenzie.)—I see that one costs Rs. 1,45,000 and the other Rs. 1,85,000?—Yes.

50. Q. (Mr. Higham.)—How much was spent on Marowda during the last famine?—About Rs. 90,000.

51. Q. (The President.)—They have very nearly the same capacity, 340 and 370 millions, but the one irrigates twice as much as the other?—Because the drainage area is larger.

52. Q. You would like to have these works carried out as soon as possible?—Yes.

53. Q. (Mr. Higham.)—Have you been working out any projects for canals from the river Mahanadi or from any of the other rivers?—I have three projects in hand, one from the Mahanadi, the second from the Tandula river and the third from the Arpa river. Some levels have been taken and sections plotted.

54. Q. Will these schemes work without storage reservoirs?—Yes, for kharif irrigation only. In October the discharge in the Mahanadi is roughly about 500 to 1,000 cusecs.

55. Q. There is plenty of water in October?—In September and October.

56. Q. In the worst years?—We should have at least half the ordinary discharge. I have stated the average of a normal year.

57. Q. If you put up a weir you can take off as much water as you like?—I hope so.

58. Q. You could not irrigate after October?—No. Not much. We might do a little. We cannot say definitely until the dam is constructed.

59. Q. Will there be any demand for water after October?—There will be a little for rabi crops, which we may be able to meet with 100 or 150 cusecs.

60. Q. You can secure the kharif crop?—Yes.

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61. Q. When does water begin to come down?—As soon as the rains set in.

62. Q. It would not come too late?—It will be late if the rains come late.

63. Q. You speak of the discharges in September and October being not more than one-fourth the normal. Do you know the normal?—Mr. Hutton took some observations of the discharge in the Mahanadi in 1900 which was a normal year, and I have worked out from those figures.

64. Q. You have no gauges?—No.

65. Q. Are there suitable sites for putting gauges in?—Yes.

66. Q. Where does the railway cross the Mahanadi?—It does not cross the Mahanadi in this province.

67. Q. Have you gone into any of these projects to ascertain if they will be profitable?—I think the canal projects which I am investigating will be profitable.

68. Q. Will they be cheaper than tank projects for the area protected?—A good deal cheaper.

69. Q. Have you worked them out in detail?—No; some of the tar schemes that I have worked out give a very low average cost.

70. Q. Tar schemes will be very cheap, but the supply will be uncertain?—I am afraid that is the difficulty. Most of the streams are mere hill torrents, but those selected for the tar schemes maintain a fair supply right through October.

71. Q. How many tar projects have you worked out?—One in Raipur, two in Bilaspur, and two in Sambalpur.

72. Q. There are six small tar projects. Are they yours?—Five are mine.

73. Q. They are estimated to protect between them about 20,000 acres in a year of drought?—Yes.

74. Q. Do you think that estimate can be relied upon?—Yes, because we have taken a very moderate discharge in September and October.

75. Q. You have provided no storage?—None.

76. Q. If the rains fail the rivers would not run?—Even the tanks will fail then; in fact everything will fail; there are no perennial rivers.

77. Q. If you have no rains and if the tanks are made big enough, the storage of a wet year could be carried on to a dry year; but it is not so with these tars, and it seems doubtful if they will protect 20,000 acres. Therefore, these are doubtful?—Yes, but the area of 20,000 acres is taken for a year like 1868-69, when there was a rainfall of about 25 inches.

78. Q. In such a year as 1899 would they protect 20,000 acres?—Yes, quite that.

79. Q. The cost per acre is very much less than that for tank; it averages about Rs. 16 per acre?—Yes. They are very cheap.

80. Q. I do not understand why you consider that that area would be protected in a year like 1899?—In 1899 the average rainfall in this district was 30.40 inches, whereas in 1868-69 it was 25.67 inches. Some talukas having smaller drainage areas than those on which the tar projects are based, maintained a small flow up to the end of September in the year 1899.

81. Q. You say in reply to paragraph 7 of Question 3, that "in villages where dorsa and kanhar soils predominate and the matasi fields are even and well embanked, the announcement regarding the introduction of irrigation is cheerfully received; and the suggestion that as high a rate as Rs. 2 to Rs. 3 per acre may be charged by Government is acquiesced in." What announcement has been made?—I called a number of malguzars and held a sort of conference with them and asked their opinion. Eight or ten men were present whose villages consist chiefly of the dorsa and kanhar areas. They said they would not mind paying up to Rs. 2 per acre.

82. Q. Rupees 2 for every acre for which they take water?—Yes.

83. Q. Would they pay it whether they take water or not?—I explained to them that they would have to pay in any case.

84. Q. They will pay Rs. 2 per acre on the area protected?—Yes.

85. Q. Did they all seem ready to do it?—Yes, because they could grow two crops.

86. Q. They think that they will grow double crop if they have tanks?—Yes. They are quite sure of it if they have water.

87. Q. Are they anxious about it; did they make any application about it to Government?—They are anxi-

ous, but have made no application about it to Government.

88. Q. (The President.)—What is the nature of the soil under the tanks that you recommend?—Dorsa and matasi soils are best suited for irrigation; kanhar soil not so much.

89. Q. (Mr. Higham.)—There is no transplanted rice in this district?—Very little.

90. Q. Can you give any explanation for that?—I think it involves extra labour and expense. The soil and the lie of the ground are against it. I understand that for transplanted rice they require more or less of an even surface and a stronger kind of cattle to plough and more water.

91. Q. Suppose you make a number of tanks, do you think it will result in an increased area under transplanted rice?—It may gradually but not at once as the existing broadcast system of growing rice requires so much less labour.

92. Q. Do you think that the uncertainty of water supply is the main cause of there being no transplanted rice in this district?—Yes, transplanted rice wants heavy waterings in July, and regular waterings right through the season. It requires late watering up to November, but the rainfall in November is very uncertain in these parts.

93. Q. Broadcast rice does not require such a late watering?—No. Only up to October.

94. Q. In September and October the requirements of both kinds of rice are the same?—Yes.

95. Q. At what time does transplanted rice require artificial irrigation when broadcast rice would not require it?—When there is a break in the rains; transplanted rice would then require immediate looking after. Broadcast rice can stand a break much better.

96. Q. In July and August transplanted rice would require water to a greater extent than broadcast rice?—Yes.

97. Q. If water is provided do you think that the other difficulties in the way of substituting transplanted for broadcast rice would be overcome; you would require bigger cattle?—Yes. The land must be thoroughly tilled before rice is transplanted, and this involves a lot of labour.

98. Q. You think it will take a very long time to effect a change in the kind of rice?—Yes.

99. Q. I understand that all these tanks are made as much for the sake of supplying water to men and cattle as for irrigation?—Yes.

100. Q. If new tanks are made and people are allowed to irrigate whatever area is assigned to a tank, do you think that they will be very careful not to take more water than is necessary or will they waste water?—I do not think they will waste it.

101. Q. Their habit now, I understand, is not to take water except during a long break in the rains, and this involves making a cut through the bank which gives them some trouble?—In the existing tanks the supply is reserved for September and October.

102. Q. That is the custom?—Yes. They are very uncertain of sufficient rainfall in these two months. If there is a break for even 10 or 12 days they prefer to wait; but if the September and October rain is deficient it does great harm, and they must take the water at once. When the ear is on the corn, the crop withers if there is no rain.

103. Q. If you give them sluices so that they can turn the water off and on as they like, do you think they will be careful in husbanding the water?—I think so. They may take it occasionally when there is a long break in the weather in July and August.

104. Q. If there is a very long break in July and August, how do they cut the bank?—No. They do not cut the embankment until September and October. They never take any water now in July and August.

105. Q. It is a regular habit of the people to husband the supply for September and October?—Yes.

106. Q. In reply to paragraph 2 of Question 24 you speak about the substitution of sugarcane for rice as a possibility?—Yes.

107. Q. If sugarcane be introduced anywhere, would it not necessitate the drawing of water from the tanks for all the months in the year?—Yes.

108. Q. The system of husbanding water for September and October would break down if sugarcane were introduced?—Yes, exactly; for sugarcane must have tanks on which we can depend from January to June.

109. Q. Do you think that the cultivation of sugarcane should be encouraged under these circumstances? Yes, wherever suitable storage reservoirs can be provided.

110. Q. Would it not upset all your calculations of duty which are based on the quantity of water required for rice?—Not in years of average rainfall when only one or two waterings may be needed for rice and the supply in the nallah feeding the reservoir during September and October is sufficient for the purpose. The tank would then remain full at the end of October.

111. Q. (Mr. Muir-Mackenzie.)—The people will have to plant their sugarcane in the previous January?—Yes.

112. Q. If by any chance the supply in tanks in the following September and October was insufficient then they would lose their crops? They will have to take that risk?—Yes, but I would restrict the area under cane and use the tank mainly for rice or design some tanks wholly for cane cultivation. As the duty for sugarcane is about three times as much as for rice, so would the rate of assessment be larger.

113. Q. It would entirely depend upon the rainfall in October or September, whether the man did or did not lose the crop planted in January?—Yes.

114. Q. (Mr. Craddock.)—I understand you to mean that it would be a risk, but the risk would not be so serious as to deter people from cultivating sugarcane to a certain extent?—Yes.

115. Q. (Mr. Higham.)—Do you think that if the tank was full there would be no harm in taking to cane cultivation?—There would be no harm, but there would be a certain amount of risk. At the same time the corresponding advantages would be greater in a series of years. The loss by evaporation in all our tank projects and in fact generally in any storage project that is possible in Raipur and Bilaspur, forms a very large proportion of the total capacity of the tank. This is due to sites most suitable for tank schemes being scarce. The storage of the top 6 feet would in most cases be only a few millions less than the storage of, say, 8 or 9 feet. If cane cultivation is substituted for rice, say, to an extent of 10 per cent. of the entire protected rice area, the tank would irrigate from October to June. The total consumption of water including the loss by evaporation, etc., would probably be very little more than the actual loss by evaporation when no irrigation is done. Assuming that for every 9 average years there is one dry year, we would secure sugarcane on 10 per cent. of the entire protected area for 10 years. In the tenth or dry year rice area which could be secured might be only 50 per cent. or even less. But the net profit would be more. There is another important gain which cane cultivation would secure. I allude to the manuring of the soil. Supposing out of a holding of 20 acres a Kirsan grows cane in 2. In the second year he will take up another plot for this purpose, growing rice in the old cane area, which would certainly yield him 2 or 3 times the average crop.

116. Q. If the next year was a dry one, would it not result in the tank being emptied?—It may, but if the catchment area of the tank is sufficiently big and the year is not entirely dry, the yield may still suffice to fill the tank. In the projects we have prepared the drainage area is in most cases sufficiently large to yield a supply enough to fill the tanks in such a year as 1899-1900.

117. Q. Your projects, as prepared, do not provide for sugarcane cultivation?—No; but as I have already said, sugarcane cultivation could be undertaken to a small extent without any harm.

118. Q. Don't you think it would be a good thing to say that water would not be given for sugarcane cultivation between October and July?—But these scanty years of rainfall come so very seldom—once in ten years or even at longer intervals. If the water is not used in average years it would be lost by evaporation. If I could cultivate sugarcane for nine years out of ten, I would run the risk for the tenth year and thus secure a larger profit.

119. Q. Have you examined many of these existing tanks?—Yes.

120. Q. What is the largest area irrigated by one private tank?—Two or three hundred acres.

121. Q. Do you think that anything could be done in the way of improving these tanks to make them hold more water or last longer?—We could improve them by raising the bunds and increasing the storage, but this would necessitate the catchment area in every case being increased.

122. Q. Are the tanks large enough for the rainfall? Is there much run-off generally?—In years of ample

rainfall they fill, but in years of scanty rainfall they do not fill.

123. Q. In a year of ample rainfall, do the tanks more than fill?—As a rule they do, but they do not overflow much. The catchment areas of these tanks are, as a rule, small.

124. Q. Would you say generally that the tanks are large enough for their catchment?—They are larger than the catchment.

125. Q. I want to know whether in ordinary years a good deal of water runs to waste?—Not much, but very little.

126. Q. There is no use enlarging these tanks unless you increase the catchment area?—No.

127. Q. Do you think that anything else could be done to improve the tanks; have they got sufficient waste-weirs?—Yes.

128. Q. Do the bunds ever burst for want of waste-weirs?—No.

129. Q. (Mr. Muir-Mackenzie.)—Did not they burst in 1896-97?—None of the old tanks did. Some of the new tanks built in the late famine might have burst.

Mr. Craddock.—It was more common in Balaghat than here.

130. Q. (Mr. Higham.)—You are not of opinion that much money could be usefully spent in improving them without increasing the catchment area?—No.

131. Q. If you increase the catchment area that would be equivalent to taking them up as Government works?—Yes.

132. Q. In such a case you have to extend the channels to other villages. Suppose you double the size of the tank you will have to take more land under command?—Yes.

133. Q. Nothing can be done to the tanks unless they are improved on a large scale by increasing the catchment area?—No.

134. Q. A great number of these tanks failed in the year of drought?—Yes.

135. Q. Do you think that anything could be done at a moderate expense by the people themselves, the Government assisting them with loans, to make them more reliable?—Something could be done by increasing the catchment area or feeding from nallas or rivers.

136. Q. Have you examined many of the tanks which you think could be improved in that way?—Yes.

137. Q. You can put forward a list of such if you are asked?—Yes.

138. Q. (Mr. Muir-Mackenzie.)—Had you charge of relief works?—Yes.

139. Q. How did you supply water to the workers?—We had to resort to streams with sandy beds which had subsoil water, into which we sank corrugated iron pipes and wells.

140. Q. In no other way?—No. We dug wells, but they all failed except in one place. I dug 80 wells along the bank of a nallah. We did not go down to the bed. The bottom level of the wells was above the bed of the nallah and yet, even in May and June, there was ample water overlying a sort of white clay.

141. Q. How deep was the water level in that particular part?—From the ground surface it was about 10 feet. That was in the hottest month.

142. Q. In the other part they failed, how deep did you go down?—As deep as 40 to 50 feet.

143. Q. What did you find?—Did you meet with rock?—Limestone rock.

144. Q. Quite impervious to water?—Yes.

145. Q. Are you at all aware whether this favourable stratum exists in other parts of the country?—Yes, in some parts of Dhamtari and Raipur tahsils and also in parts of Drug tahsil.

146. Q. Do you think it would be useful to make a survey as to the level at which the subsoil water is found?—Yes.

147. Q. Suppose over a considerable area favourable conditions were discovered, is there no chance of getting people to take to well irrigation in those areas?—I do not see why they should not take to it, if the level of the subsoil water is high and the consequent labor of lifting it is light.

148. Q. Would they have to dig permanent wells or cheap kacha ones?—I think they will have to dig

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permanent wells because the surface soil in such areas would generally be black cotton which would fall in during the rains. It would not do to have anything but durable wells.

149. Q. Have you ever seen any wells in the irrigable area of tanks?—No.

150. Q. Not for sugarcane in any parts?—I do not think so.

151. Q. Do you think that if wells had been dug in the irrigable area of tanks, crops could have been saved in a famine year?—The irrigable area in the lowest part of a valley just below a tank bund is so wet that they would not require any irrigation.

152. Q. Even in a famine year?—Wells in such position might save small areas in dorsa soil in a famine year.

153. Q. In that small area do you think they would not have found water?—If you dig wells below tank bunds you are pretty certain to get water. But what is required is to irrigate the lands higher up. This could not be done within pumping or lifting the water to that level.

154. Q. Did not the area immediately below the bund also fail in the famine?—I could not pay for certain. When tanks held out till October they could not have failed.

155. Q. But a great majority of the tanks did not hold out?—They had some water in September. I believe in the case of large tanks, the land below them did not fail. Even if a tank dried up in October the fields below it remained wet.

156. Q. I understood that in the famine of 1899-1900, a great majority of the tanks failed altogether. Did they not?—They did.

157. Q. They did not contain water at the end of September or October?—Irrigation tanks except the larger ones did fail.

158. Q. Do you think that if wells had been dug below these tanks they would have held water?—Yes, they would have.

159. Q. They would have saved some crops?—Yes, a very small area.

160. Q. In your answer to clause 1 of Question 3 you say, "But it so happens that where there is little or no cultivation many such schemes are available, whereas in the more densely populated and cultivated tracts, the scope for such projects is limited." Can you give me an instance?—In one or two projects that we have worked out, close to the hills we have big lakes formed by the bunding up of nallahs. There is one for instance near Gandai.

161. Q. Have you any hopes that water would be taken up in that area?—It would be taken up if we construct long irrigation channels.

162. Q. Would people take water? There are so few people?—I think they would.

163. Q. If you have not got cultivators to take water, how could you hope to dispose of the whole?—Not the whole unless you have long irrigation channels and take them down miles and miles below.

164. Q. That is to take the water into the country where people would take it?—Yes.

165. Q. Other schemes are of the same kind?—Yes.

166. Q. If you made one of the tanks at a place in which there were very few cultivators, do you think that there would be any chance of cultivators being attracted to that area from elsewhere in order to get the water?—It is a very difficult question to answer. They would not go long distances. They would go near but not far.

167. Q. Am I quite right in understanding that in normal years no water will be required before September and October?—Yes.

168. Q. If the monsoon be late would they not want water to sow?—Then sowings would be late as they would wait for the rains. But they do not generally require water for sowing.

169. Q. When is sowing begun generally?—About the middle of June.

170. Q. In reply to clause 7 of Question 3 you say, "In villages where dorsa and kanhar soils predominate and the matasi fields are even and well embanked the announcement regarding the introduction of irrigation is cheerfully received." Does irrigation necessitate the careful embanking of rice fields to receive it?—Yes. Otherwise you would require constant watering. With an embankment, one 6-inch watering would hold for a long time.

171. Q. If the people are going to take water they must put themselves to the expense and trouble of embanking their fields?—Yes.

172. Q. Do you think that would make people reluctant to take water; are they too lazy to embank their fields?—No. They generally embank their own fields and find it very useful.

173. Q. Do you think that much benefit would be done to the country in a time of famine by employing famine labour in embanking fields?—Yes.

174. Q. Was it done at all in the last famine?—Not so far as I know.

175. Q. (The President.)—What is the height of the embankment?—The usual height in matasi is 15 to 18 inches. I would like to see them 3 feet. They are higher elsewhere where the ground is flat.

176. Q. Would you have any difficulty in organizing labour for employment on such works, works of extensive field embanking?—I think it could be easily done.

177. Q. Would you prefer to see such works done by the Public Works Department, or handed over to the Civil Department?—To the Civil Department.

178. Q. Why?—Because they know the local conditions better than we.

179. Q. But not owing to the difficulty of controlling labour or fixing tasks?—No. The Public Works Department should come forward to help them.

180. Q. Would you kindly explain the meaning of the word *chakbandhai* in clause (9) of your reply to question 3?—The holdings are very small in Raipur and Bilaspur. If you have large plots as in the United Provinces and the Punjab they are called *chakbandhaies*.

181. Q. In reply to the next question you deal with *takari*. Will you tell me what opportunity you have had of acquiring this information?—Very little. This is what I have gathered from local enquiries.

182. Q. Most of the statements that you make are subject to correction?—Quite.

183. Q. Do you think if the Public Works Department officers in your position were given the opportunity of disbursing *takari* for tanks, they could do good work and induce people to take the money?—Yes.

184. Q. You think that if the Public Works Department officers were entrusted with the power of disbursing money as Revenue officers are, they would succeed? What special opportunities will they have?—The Public Works Department officers have to tour through the district all the year round and they could distribute advances at any time.

185. Q. Do you think that a *malguzar* would accept advice if you told him that his tank is susceptible of improvement and would be willing to take money on the spot?—Yes.

186. Q. You say in answer to Question 6, "In the rice tracts of Chhattisgarh, especially in the Raipur and Bilaspur districts, the desire for the extension of tank irrigation has never been so marked as it is now." Do you not think that that desire will become much fainter when they have two or three good years?—They will never forget these two famines in Raipur and Chhattisgarh.

187. Q. I suppose that in the famine of 1896-97, when there was a good deal of rain in the early part of the year, all your tanks were exceedingly useful and very efficient?—Yes, very efficient.

188. Q. In ordinary years the greater part of the area irrigable from the tank is supplied merely by percolation in many instances?—Yes.

189. Q. Don't these lands get swamped? Don't they get too much water in ordinary years?—Only the areas in kanhar soils suffer if there is abundant rainfall and if the land happens to be just below a tank, but not otherwise. Such tanks in black soil are very few. Generally you have these tanks higher up.

190. Q. You know the ryotwari side of the Chhattisgarh Division just as well as the other side?—Yes.

191. Q. Are you aware that cotton cultivation used to be practised there formerly?—I do not know.

Mr. Craddock.—You say that people are anxious about the assessment on their rice lands?—Yes.

192. Q. Do you think that it was more than a mere anxiety that the rents might be enhanced at the settlement or do you think that it really deterred them from irrigating the land?—They are doubtful if the benefits would be proportionate to what they would have to pay as enhanced rates; if they could be sure that they would benefit considerably they would not mind paying a good proportion of the revenue to Government.

193. Q. You do not think that they have been deterred in the past in any way?—I do not think so.

194. Q. This anxiety which you speak of is merely an anxiety, because the new settlement is going to be made?—Yes, but in one case I know sugarcane cultivation was given up.

195. Q. That was a case of dropping a crop for a year or two and waiting till after the settlement. Would the fear of enhancement deter any man from irrigating his lands if he is inclined to do so?—If it is his own tank of which he bears all the cost and keeps it in repair and if he then has to pay extra rent to Government naturally he is discouraged. In this case it is a malguzari tank and he has to carry out all the repairs.

196. Q. Did he not know that the improvements are exempted?—They are not permanently exempted. The exemption is only for one settlement.

197. Q. Do you think he understood that?—Yes.

198. Q. Was this a very old tank?—Yes.

199. Q. He was using the tank and irrigating the land under it. He merely said that he was anxious about the assessment, and he was afraid lest his assessment should be high. But that has not deterred him in the past?—I could not say that.

200. Q. He was merely afraid that the Settlement Officer would drop on that land heavily. In the course of preparing these projects you must have had many a talk with the people. Is it your general conclusion that the appreciation of irrigation will spread?—I think it will.

201. Q. Do you think people will pay for it?—Yes, but I do not think the villages in *bhata* and *matasi* soils will reap so much benefit because they cannot have double crops. It is the double crop they want to be quite sure about.

202. Q. As regards the *tar* projects you have seen a good many constructed by malguzars?—Not many, only a few.

203. Q. Do you think malguzars would be able to extend them with the aid of *takavi*?—I think they would, if we could give them professional advice.

204. Q. You think they require professional supervision?—Yes.

205. Q. These *tars* would often affect other men's land?—They would.

206. Q. How would you provide for that?—I think the men through whose lands the *tar* channel would pass would not object, if they are given a share of its benefits. It may, however, in some cases, be necessary for Government to interfere and acquire the land.

207. Q. Do you know if people of more than one village could be made to combine to make a *tar*?—They would, if they saw the advantage.

208. Q. Do you think that land could be usefully acquired for the purpose of making these *tars*?—Yes, if it is necessary. If they cannot be made to understand the advantages of co-operation in a matter like this, Government should acquire the land.

209. Q. In reply to Question 12 you say: "I therefore consider that no irrigation channels drawing their supply from any but the largest streams could be relied upon for irrigation in a year of drought." Would not *tars* be useful in any year, even in the driest year?—There is a greater chance of a *tar* scheme failing in a dry than in an ordinary year. But some *tars* that are dependent on perennial or somewhat perennial streams, as for example the Nandkutti *tar*, might be useful even in such a year as 1899.

210. Q. The point that I wish to get your opinion about is: do you think it would be worthwhile to expend money on a number of *tars*, or do you think it is not worthwhile doing so as they are likely to fail when they are most wanted?—We can select certain *tar* schemes by taking discharge observations in September and October, and thus see whether they could be relied upon. If there is any supply in February and March such streams could be relied on.

211. Q. Even if it be so, would you not recommend the construction of *tars* for 9 years out of ten?—Yes, I would.

212. Q. You would not condemn *tars*?—Certainly not, in ordinary years. But in years of drought they could not be relied upon.

Mr. Muir-Mackenzie.—How would you ascertain those streams that would last? I hope your years of drought are gone and we are not going to have any more for a long time?—If a stream flows in ordinary years till February or March, it will, I think, last in a dry year till October.

Mr. Craddock.—Comparing tanks and *tars*, which do you think the best to push so far as private enterprise is concerned?—Tanks are a much more certain way of securing irrigation than *tars*. I mean storage tanks.

213. Q. I am talking of private enterprise and not of big projects constructed by Government?—Small storage schemes will be better than *tars*. *Tars* can be relied upon only in a few instances.

Mr. Muir-Mackenzie.—Is not the *tar* of some value in increasing the storage in tanks?—Yes, if the cost of the *tar* channel to divert the flood water from the *nalla* into the tank is not great and such a scheme is possible.

Mr. Craddock.—Does not the construction of storage tanks have the effect of submerging some of the best lands in the village? Would not the construction of village tanks submerge the *barha* or lowest land?—I would not build them in *barha* lands, but higher up.

214. Q. You said that water would never be required before September. Would it not be required for *biasi* operations in July or August?—Yes. But up to now there has been no year in which *biasi* operations have not been successful.

215. Q. In the year 1899?—Even in that year in Raipur the *biasi* operations were, I think, more or less completed.

216. Q. Have you ever asked people about the transplantation of rice?—I have asked them is one or two instances.

217. Q. You have said that one of the reasons for which you thought that transplantation was not practised was want of water?—Yes.

218. Q. Did you ever hear that the *lakhabata* system has deterred people from adopting transplantation?—I do not know the system.

219. Q. I will explain that. Small plots of rice belong to different people instead of one block belonging to one man?—I have not heard of that.

220. Q. (Mr. Muir-Mackenzie.)—Does the *biasi* system result in emptying the tank; do people who follow the *biasi* operations completely empty the tank for the time being?—No. They generally keep a reserve supply for September and October.

221. Q. Do they cut the bunds for *biasi* operations?—They do not use the water from the tanks. It is kept reserved for September and October.

WITNESS No. 17.—Mr. E. R. K. BLENKINSOP, I.C.S., Settlement Officer, Raipur.
Replies to printed questions.

A.—GENERAL.

1. Q. The answers given below refer to the Raipur district. I was in this district for 4 months during the famine of 1896-97 and have been here since December 1897 as Settlement Officer. In 1896 the abrupt termination of the rain resulted in a bad famine, and in 1899 in a famine which has had no equal in the memory of the oldest cultivators. This year (1901) the late rain failed and there was a great opportunity for irrigation. In 1897, 1898 and 1900 the rainfall was seasonable and adequate.

The total area under rice is about one-and-a-half million acres, but the largest area recorded as irrigated in any one year is 42,720 acres in the famine year 1896-97 or less than 3 per cent. In that year 7,397 acres of garden land were irrigated from wells, but the questions of rice irrigation and the irrigation of

garden land are quite distinct. The average rice area recorded as irrigated is not more than 1½ per cent. of the area under rice, and is much below the area that is commanded by tanks other than those required for *nistar* purposes, i. e., for water for men and cattle. The area commanded amounts to between 5 and 6 per cent. of the rice area. I do not think that any of the heads (1) to (8) explain the failure to resort to and extent the means of irrigation in this district. The chief obstacle is to be found in the local custom of *lakhabata*, meaning that up till quite lately the fields of a village were continually being redistributed between the cultivators. Although other cultivation is really of no small importance, rice is all important in the eyes of the Raipuri. The rice land is of very variable quality, and it is the local custom that every plough of land shall consist of an equal area of every soil and position. Hence the slopes are cut up into

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fields often of infinitesimal size, and except where a strong *malguzar* gets a group (local term *chak*) of fields by exchanging with tenants or getting rid of tenants, adjacent fields are seldom held by the same cultivator. Some villages contain as many as 8,000 different fields, and 5,000 to 6,000 are commonly found in one village in the light soil tracts. Since neither the *malguzar* nor any tenant as a rule have any large group (*chak*) of fields, there is no inducement to incur a large expenditure for the benefit of a few isolated fields. This difficulty originated in the joint nature of the village community, and could only be surmounted by joint action on the part of *malguzars* and tenants. For various reasons the village unity has been greatly weakened, and cases of joint action are now rare. Another solution would be the changing of water rates. This, however, is not customary and would be very difficult to regulate. In the few cases that I have come across the cultivators pay so much per plough of land and not according to the area protected. In the present settlement I have endeavoured to reward those who have made improvements by exempting from the irrigated factor not only fields watered by the improvement, but all the irrigated land they hold in the village.

Another reason for the small resort to irrigation lies in the character of the people. When villages were held on lease, the lessees made many improvements hoping that this would secure them extensions of their leases. When the lessees were constituted *malguzars* it was hoped and anticipated that having absolutely secure possession, they would spend still more in developing their villages. The result has been exactly opposite and this is very characteristic of the native as I know him, or at any rate of the Raipuri. One bird in the hand is worth five hundred in the bush. Secure possession induced complete indifference. This same instinct is also seen in the way they allow their rice to wither up and dry day after day rather than make the necessary cut in the tank bund or throw a bund across a *nalla* to divert the water at a cost of Rs. 10 or Rs. 15 or dig a temporary well at a cost of Rs. 2. I heard of many cases in the famine of 1899-1900, where, with water readily obtainable at a depth of 5 to 6 feet, cultivators did not dig wells till too late and obtained only one-fourth of the crop they might have had.

The system of *thar* (petty canal) irrigation which is peculiarly suited to this district, has in many cases fallen into disuse by reason of this apathy and the weakening of the village unity. Cultivators are paying practically the same rents as they were paying 35 years ago, although prices have trebled and they have a market brought to their doors by the railway, whilst formerly their surplus grain in good years used to rot want of a purchaser. They have not materially improved their standard of comfort and way of living, but have become more indolent and neglect their cultivation, or hire labour where they used to labour themselves.

In former days when a tenant became wealthy, his chief ambition was to make a tank and plant a grove. There are now other outlets for surplus wealth, and I have met very few cases of this.

4. Q. I consider that the existing provisions for exemptions are sufficiently liberal, but rents are so low in Raipur that any exemption is trifling compared with the outlay. As stated in my answer to the last question, I have, owing to the *lukhabata* difficulty, recommended assessment at dry rates for all the irrigated land held by the person who has made an improvement and not only the land irrigated by the improvement, provided that not more than one acre be exempted for every Rs. 15 of outlay.

5. Q. In my answer to No. 3, I have said that there is very little incentive to improvement, or reward of enterprise. Tanks are made mostly by conservatives of the old stamp to perpetuate their names, and rather from *pun* (religious motives), to provide water for men, cattle and birds, than with a view to irrigation. Grants-in-aid would, I think, much encourage the construction of tanks for irrigation, but the recipients should be carefully selected from amongst honest and deserving men. Many would endeavour to make a show of work on the grant alone, spending little or none of their own money. Devices such as ploughing up the surface after a shower of rain, instead of digging, render it difficult to estimate the actual cost by measurements.

6. Q. There has been no great extension of irrigation. The tanks made in the recent famines have been constructed impartially all over the district. If a scheme of irrigation were carried out in a particular locality, it would not to any great extent draw off people from other parts.

Cultivators in the light soil tracts would be very glad to have irrigation largely extended, but they are not willing to pay much for it yet. A constant water-rate of more than one rupee per acre would at present be looked upon as harsh; but the construction of a few large works, and selling the water when required would demonstrate strongly the benefits of irrigation, provided that the September and October rainfall continues variable and inadequate, as it has been for the past seven years. I think a water-rate of Rs. 5 per acre is the maximum that would be worked up to, until there is marked improvement in the methods of cultivation and quality of the rice grown. Cultivators will not willingly accept a permanent water-rate, but would be glad of the opportunity of purchasing water, when necessity arose, but their penny-wise instincts will at first lead them to refrain from purchasing till it is too late, or almost too late, in the hope of rain falling. Continued failures would, however, soon set this right; but I must reiterate that rents are so low and prices have risen so much that they are quite content with an eight-anna crop (60 American Notation) and neglect the most ordinary precautions for securing a full crop, such as keeping their *merhs* (field banks) in repairs, keeping out cattle, manuring and even weeding. Excessive prosperity has induced carelessness and indolence. A succession of short crops would have proved a good corrective, but the famines of 1896-97 and 1899-1900 were too severe a tonic, prostrating absolutely for the time a tenantry who had become quite careless of the future and of debt, secure in the knowledge that one good year would enable them to pay off two or three years' arrears.

D.—TANKS.

23. Q. (1) The vast majority of tanks depend entirely on their catchment areas. In a few cases, however, the tanks are fed by *tars* (small canals), into which the water of *nallas* is diverted by *bunds*, mostly of earth and temporary. I can only call to mind two permanent bunds of masonry fitted with sluices in this district. Tanks so supplied irrigate very large areas. These *tars* are sometimes made without storage tanks, but failure of the rainfall in September renders them practically useless. This form of irrigation is peculiarly suited to the district, but has of late years fallen into disuse.

(2) The bund of the tank is cut through in one or more places and the water let out into the adjacent fields. It is sometimes led considerable distances in surface drains as the people have a very good idea of levelling. In the late famine I had masonry sluices made in most of the new tanks in the Raipur tahsil, but many of these have been neglected and allowed to fall into disrepair by the people.

(3) (a) In a year of ample rainfall irrigation is but little resorted to. The area recorded as irrigated from tanks in 1888-89 was only 2,413 acres or 00.18 per cent. of the rice area and probably most of this was by percolation and not by cutting the bund.

(b) In a year of scanty rainfall one watering is given of about three inches according to my rough calculation.

(c) In a year of drought two waterings are given and in 1899-1900 a third watering was given, where possible by lading out the water below the level of the cuts in baskets (local term *chhapa*). In that year three waterings were necessary to secure a full crop. The water was given about the middle and end of September, and the beginning of October.

(4) Some of the largest tanks and tanks fed by *tars* irrigate 100 to 700 acres. The average is between 40 and 50 acres.

24. Q. (1) In this district the double cropping depends entirely on sufficient moisture remaining in the fields at the time of broadcasting the seed in October and the area double-cropped is therefore very variable. The highest recorded area under double crops is 661,250 acres in the year 1893-94 and the lowest 20,590 acres in the year 1899-1900. The black-soil rice area of the district is about 1,000,000 acres; much of this is not at present double-cropped, because from its position moisture does not remain. With irrigation this area also would be double-cropped. In a year of scanty rainfall the double-crop in highlying fields is very poor; irrigation would ensure a full yield.

(2) I do not think irrigation would lead to the substitution of more valuable crops at present. The cultivation of sugarcane has been on the decline for some time, and is extinct in many villages, although there is plenty of water. Before the opening of the railway, the district supplied its own *gurrh*, but now most of the *gurrh* is brought in from outside. The manure

and water, of which this crop consumes a great deal, are diverted to the rice land and the cultivators are glad to avoid the extra labour entailed. Garden crops depend upon the demand, which is, I think, already fully met. There is already plenty of water available along the nalas and rivers. Rice is a very important crop and the cutting affords continuous occupation for about six weeks. It therefore suits the cultivators better to have several species ripening at different times. The early rice is inferior but serves for local consumption. I do not think the better species would be substituted to any great extent.

24. Q. (3) (a) In a year of ample rainfall irrigation is not generally needed, *vide* 23 (3) (a) above, provided that the distribution is suitable. In 1896-97 there was a very heavy rainfall, but owing to early cessation there was a famine. The following year, 1897-98, the distribution was suitable and rice gave a bumper yield, but even then the later rain varied from village to village and some benefit would have been derived from irrigation. In a year when the rainfall is suitably distributed and there is heavy rain in September and in the first half of October, there would be little or no advantage from irrigation.

(b) and (c). It is hardly possible to separate these two heads. 1896-97 was a year of drought, as also 1899-1900, but in the former year there was a 4-anna crop (30 American Notation) whilst in 1899-1900, the crop would be over estimated at 1 anna (or $\frac{1}{4}$ American Notation); so also with years of scanty rainfall, the outturn may be anything short of a normal. The Commissioner, Chhattisgarh Division, who had previously settled this district in the years 1885-1889, and as Commissioner of Settlements had frequently toured through the district since, consulted me on this point, with a view to preparing a form of report on the Public Works Department schemes which have been recently surveyed. We have both made and dealt with large numbers of crop experiments in rice and have made continual local enquiries as to outturns and the difference between the yields in irrigated and unirrigated areas. We agreed that over a series of years, full irrigation would give an advantage of—

50 per cent. in black soil.
100 per cent. in yellow soil.
140 per cent. in red soil.

My own experience has been mostly confined to bad or moderate years, which would justify far higher percentages; but the above percentages are as modified by Mr. Carey, Commissioner of Settlements, with an experience of this district of over 15 years. Shown in outturns, we adopted the following factors for cleaned produce (rice not dhan) in pounds:—

	Normal factor over a series of years.	With full irrigation.
Black soil	600	900
Yellow „	450	900
Red „	250	600

25. Q. (1) After a certain point damage begins and increases every day that water is withheld. I have frequently met with losses of half the outturn by reason of withholding water, till some days after the damage had commenced, in the hope of rain.

(2) In 1899-1900, the rice failed with one and even with two waterings. A full crop was obtained in a few cases with three waterings. I could make a rough estimate of the probable amount of damage in definite cases, i.e., given the kind of soil, species of rice, and amount and date of the last watering, but not otherwise.

26. Q. I do not know of any case in which rice land is watered from wells as well as from tanks. Sugar-cane and garden land is sometimes watered from tanks so long as the supply holds out and afterwards from wells.

27. Q. (1) Please see 24 (b) and (c). The normal outturn of an acre of black soil may be taken at 600 lbs. of rice and 200 lbs. of peas or other second crop, value Rs. 18-8-0. The corresponding outturn with full irrigation may be put at 900 and Rs. 300, value 27-12-0.

	Normal.	With full irrigation.
Yellow soil	450 lbs. rice, value Rs. 11-4-0	900 lbs., value Rs. 22-8.
Red soil	250 lbs. rice, value Rs. 6-4-0	600 lbs., value Rs. 15.

(2) In a year of drought the outturn may be taken at *nil* as in 1899-1900, or up to four annas (30 American Notation) as in 1896-97. In 27 (1) rice has been valued at 20 seers to the rupee and the second crop at 28 seers to the rupee. In a year of drought 11 seers and 13 seers

would be the approximate rates, or for simplicity it may be assumed that the produce would have a double value. The increase would then be—

	Rs.	A.	Rs.	A.
Black soil	{ 1897 . 14 0 . }		to 55	8
	{ 1900 . Nil . }			
Yellow	{ 1897 . 11 4 . }		„ 45	0
	{ 1900 . Nil . }			
Red	{ 1897 . 7 8 . }		„ 30	0
	{ 1900 . Nil . }			

Assuming, however, that irrigation were widely extended, the rise in prices would not be so marked and these figures would require some modification.

28. Q. There are very few cases of a water-rate being paid regularly and a few cases where water has been paid for in one of the two famines. Where a separate water-rate is paid, neither rent nor revenue is enhanced. Up to Rs. 10 per acre is paid for sugar-cane and garden land, but not more than Rs. 2 per acre for rice land and generally less. Tenants pay for water according to the number of ploughs of land they hold, and because of the *lakhbata* system this usually gives fair results.

In rent proposing the percentage added for irrigation varies for every different soil and position, and with the same soils and positions the actual cash enhancement varies from village to village because of the different village all-round rates adopted. Roughly, it may be taken that the all-round enhancement per acre is 50 to 60 per cent. or five to six annas. Of this, Government takes the same percentage as is taken of the village assets, generally between 50 and 52 per cent., except in the case of exemptions on account of improvements. This enhancement is paid on all the land marked as irrigable by the Settlement Officer except, as above, in the case of exemptions.

29. Q. No expenditure is incurred. Such labour as is necessary is done by the *malguzar* and tenants jointly. The *malguzar* and tenants who do not work personally send their permanent field servants.

30. Q. Tanks are primarily made for *nistar*. They are very rarely repaired or cleaned out. Any repairs are carried out by the owner. The Government tanks made in the famine are falling into disrepair and the bunds are being cut away by the rain. *Malguzars* should be required to see to this. If not entirely made over to them, the necessary watching and patching would readily be taken up in most cases by a tenant, who could recoup himself by growing kodon, castor-oil, til or arhar on the bund. The sowing of one or more of these crops diminishes the erosion.

31. Q. Water-dues are very rarely realized, *vide* 28 above. The owner gives or refuses the water at his pleasure. I cannot recall any case of trouble and I do not think any interference is necessary.

32. Q. I think it advisable that tanks should be made, and the best thing would be to encourage the *malguzar* and tenants to undertake the construction jointly. The present time is not very suitable, however, as they are somewhat reduced by the famines. Private persons should be assisted in securing suitable sites, and by grants-in-aid on condition that they allow the high-level water to be used for irrigation.

33. Q. Tanks silt up very much, especially in black soil. I cannot give any exact statistics as regards the depth of silt accumulation per annum. Silt (local term *laditi*) is taken out by good cultivators and used for manure. A back wall is usually made to prevent silting up. Black soil tanks without a back wall very soon silt up.

E.—WELLS.

34 to 37. Q. Permanent wells are not used for irrigation. A number of such wells have been constructed by Government to improve the drinking supply and check cholera, but the people will not generally use them till all the tanks are dried up and most of them have fallen into disrepair.

38. Q. I have no special knowledge on this point. I do not think it would be any use to attempt to encourage the construction of permanent wells for irrigation, as cultivators would not use them.

39. Q. *Vide* 38.

40. Q. Except in years of drought temporary wells are used only for irrigating garden land and sugar-cane. They are fed by percolations. One well will irrigate from half an acre to an acre of garden land. They are constructed in one to three days by personal labour. In years of drought, enterprising cultivators sink temporary wells, but the water is said to be inferior to tank water and both are said to be inferior to rain in fertilising qualities. This may be so, as a

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full yield is not generally obtained by well irrigation, but this is certainly due in many cases to the wells not being sunk till after more or less damage has occurred. The water is lifted by means of a wooden lever (local term *tenra*) and an oil tin. The largest area irrigated from wells in any one year was 8,582 acres in 1898-99. Irrigated garden land does not usually pay a separate water-rate, and is often included in the holdings. Where separate rents are paid they vary from Rs. 2 to Rs. 10 an acre.

Owing to the apathy of the cultivators many oppor-

tunities of making temporary wells in years of drought are neglected. I would propose that the district should be systematically examined and trial wells sunk wherever water is likely to be obtained at a depth of 15 feet or less in the month of October; where these prove successful, cultivators should, on the early cessation of rain, be compelled to sink wells and water their rice. In sandy tracts the construction of temporary wells might be encouraged by supplying corrugated iron pipes, such as were used by the Public Works Department in the famine of 1899-1900.

1. Q. (*The President*.)—You are the Settlement Officer of this district?—Yes.

2. Q. How long have you been in this district?—Since the end of 1897. I was also here for 4 months in the first famine, i.e., from December 1896 to March 1897.

3. Q. You have been Settlement Officer here for five years?—Yes.

4. Q. Did not the famine interrupt the settlement? Yes. It did—the second famine. I was on famine duty as well as in charge of the settlement.

5. Q. You say in reply to Question 1: "The average rice area recorded as irrigated is not more than $1\frac{1}{2}$ per cent. of the area under rice, and is much below the area that is commanded by tanks other than those required for *nistar* purposes, i.e., for water for men and cattle"—then the tanks do not do the duty that they might do?—No. The area we record at the settlement as irrigable is much greater than the normal area irrigated.

6. Q. That means that the people are indifferent and do not take the trouble to irrigate?—Partly; prices have risen and they are unwilling to take the smallest amount of labour or trouble. They do not bother to cut the tanks.

7. Q. That is a bad omen for any extension of Government irrigation in the country?—Yes.

8. Q. You say in reply to the same question. "The chief obstacle is to be found in the local custom of *lakkhabata*, meaning that up till quite lately the fields of a village were continually being redistributed between the cultivators." Has that system been abolished?—The system is no longer in force in the district. But the effect of it remains in the tenants having their fields scattered all over the village and no group of fields close together; but although the system of splitting up the land no longer prevails, they are not making any effort in the direction of forming *chaks*. Mr. Laurie, who was Deputy Commissioner five years ago, attempted to make *chaks* and to get the fields together, but without much success. It led to many disputes afterwards. If the Deputy Commissioner gets them to agree to the exchange, they afterwards say that they did not intend to agree to it and were forced to do so.

9. Q. It seems to be an absolutely hopeless system of doing satisfactory agriculture?—Yes.

10. Q. You approve of the *tar* system?—Yes.

11. Q. I suppose that all you count upon a *tar* doing is to supply water for a few weeks after the rainy season?—I do not propose to depend upon the *tar* to that extent even, because there are very few streams that have a flow of water after the actual rainfall has stopped. I propose to use the *tar* in order to increase the benefits of existing tanks or in connection with storage reservoirs by catching the rain as it falls. The simplest form of *tar* is a mere contour drain to impound the rainfall of the highlying land. Cheap bunds made of earth are used to divert the water of small nallas. For streams with a strong flow, I propose masonry bunds with wooden doors. There are two instances of this in this district.

12. Q. In reply to Question 6 you say: "Cultivators in the light soil tracts would be very glad to have irrigation largely extended, but they are not willing to pay much for it yet. A constant water-rate of more than one rupee per acre would at present be looked upon as harsh." At the same time, you remark in reply to Question 24 that full irrigation would give "an advantage of 50 per cent. in black soil, 100 per cent. in yellow soil, and 140 per cent. in red soil." And yet that advantage they do not think is worth more than one rupee an acre?—In examining public works schemes, I have enquired of the people and pointed out to them the cash value of water. This year there was a considerable failure of rains, and although they admitted that their loss per acre was Rs. 10, yet they would not agree to pay more than one rupee, in fact 12 annas. They were willing to pay

for water, but they would not agree to pay a constant fixed rate.

13. Q. (*Mr. Muir-Mackenzie*.)—They would pay a good deal more than what they agreed to pay?—Yes.

14. Q. (*The President*.)—Would there be any legal difficulty in imposing a wet rate upon the land commanded by a new tank?—I should not think it advisable to compel them to pay a water-rate; I should prefer to induce them. In regard to some tanks we might put the water up to auction. There is the Morid tank under which 700 acres are irrigated and which waters five villages. There was not sufficient water for the land under cultivation and the people were quarrelling for it. By offering that water for sale one would get some idea as to what the people would be prepared to pay.

15. Q. Is that a Government tank?—Yes, the scheme was suggested by the *malguzar* of Aundhi, but as it would benefit five villages, the work was carried out by Government.

16. Q. You say in reply to Question 23, paragraph 2: "In the late famine I had masonry sluices made in most of the new tanks in the Raipur tahsil, but many of these have been neglected and allowed to fall into disrepair by the people." You had hardly finished them before they fell into disrepair?—In the year after the famine there was a very heavy rainfall; I was on leave at the time; the water washed away the bunds and with them the sluices were also carried away, or much damaged.

17. Q. Did not the people take the trouble to save them?—Not in many cases.

18. Q. They are all Government tanks I suppose?—Yes, constructed in the last famine.

19. Q. You say in reply to paragraph 2 of Question 24, "I do not think irrigation would lead to the substitution of more valuable crops at present. The cultivation of sugarcane has been on the decline for some time." That means a lack of energy on the part of the people?—Yes.

20. Q. Wells seem to be nowhere in vogue even for drinking purposes?—No; a great many *pakka* wells have been made by Government for sanitary purposes during the past ten or twelve years, but many of them are quite out of use; the water has gone bad for want of use; the people prefer the tasty tank water.

21. Q. You say in reply to Question 30: "The Government tanks made in the famine are falling into disrepair and the bunds are being cut away by the rain." Are not these tanks under the Public Works Department?—No. They are under the Civil Agency.

22. Q. They are supposed to be profitable?—Yes.

23. Q. Are measures taken to keep them in repair? *Patwaris* are supposed to keep them in repairs. They are told to do their best by sowing castor-oil and *til* on the bund. They said that the rain was so much that the seed was washed away.

24. Q. In reply to Question 32 you say: "I think it advisable that tanks should be made, and the best thing would be to encourage the *malguzar* and tenants to undertake the construction jointly." Would you encourage them in regard to tanks affecting more than one village?—Not unless the other villages belonged to the same *malguzar*. Otherwise there would be disputes.

25. Q. Would you recommend that such tanks should be made by Government?—It might be possible to arrange it otherwise; but I think it would be better on principle to work large tanks affecting more than one village through Government.

The President.—The system of *malguzar's* tanks is quite a big thing here. The system of private tanks is almost unknown in Madras.

Mr. Muir-Mackenzie.—There are many in the *zamindari* areas.

Mr. Rajaratna Mudaliar.—The revenue to Government having been permanently fixed, the Government of Madras does not interfere with the internal management of *zamindaris*.

26. *Q. (The President.)*—You say : “The present time is not very suitable, however, as they are somewhat reduced by the famines. Private persons should be assisted in securing suitable sites.” You contemplate the work being done by other than malguzars?—Yes, it used to be a common thing for a person when he became wealthy to spend his money, as an act of piety, on the construction of a tank. There are many cases of that kind.

27. *Q.* Would a man consider that he had a perfect right to take water from a nalla by a *tar* or channel of some sort and to appropriate it for the purpose of irrigation if he could get right of passage through the land of another person, or is the water considered to be in any way the property of Government?—There is no difficulty of that kind, judging from the number of *tars* that exist either in use or disuse.

28. *Q.* Looking at the question of protection against famine as a national question, do you not think that Government ought to have the same power over the water of the country as it has over the land of the country, to take it up and give compensation for vested right?—If people do not utilise the water themselves, the Government ought to have the right of utilising it.

29. *Q.* We might have cases in which the Government's utilization of water would be for the benefit of many, whereas its utilization by a private individual would be for the benefit of a few. Is it not right that the Government should have the power to acquire rights in water similar to those which it now has in land?—Yes. Unless the existing right is proved, the Government should have the right to take it up.

30. *Q.* Suppose there is a right, should not Government have the power to buy it up?—Yes, if the existing right hampers the action of Government.

31. *Q.* You would require legislation for this in this province?—I should say so.

32. *Q.* Suppose that in dealing with famine protection on a large scale, we should come to the conclusion that it is right to create half a dozen large reservoirs and that the best way to use the water would be, as it probably will be, to pass dams across the various nallas and streams so as to feed existing tanks, would the Government have the right at present to do this without reference to malguzars? Otherwise where is the revenue to come from? As I understand the case, the men who cultivate under a tank are the tenants of malguzars who are the owners of the tank and whom they pay for water?—There is very seldom any payment for water. When a new tank is made by a malguzar, he does not charge any water rate, and he does not raise the rent. Almost all the tanks have been made for men and cattle in recent years. I think from the number constructed in the past, they may have been intended for irrigation.

33. *Q.* How is Government to get any revenue from storing water in malguzari tanks?—I should offer them water for their tanks and they should pay a certain sum for it.

34. *Q.* If they refuse?—Then the question is whether they ought to be compelled to take it. I do not think they ought to be.

35. *Q.* Irrigation is apparently confined in this country to about 3 or 4 months in the year?—About two months practically; the carrying of water to the fields is done only in September and October.

36. *Q.* Is there any irrigation done except for rice? There is no other irrigation in the district except for garden cultivation, including sugarcane which has nearly died out. They embank wheat land and I have been told that they would take water for wheat land in certain areas.

37. *Q.* We could give water up to March by storage, but is there any chance of people taking it? Do they raise much *juar*?—A little in the zamindaris, but practically none in the open country.

38. *Q.* What crops are now in the ground?—Wheat and gram.

39. *Q.* Is the wheat not cut?—In the best soils it is still standing.

40. *Q.* It never wants water, I suppose. It does not take it?—There are no facilities for giving water. They would water it, if they could, in years like the present.

41. *Q.* I have seen lots of tanks with water in them. Is there any wheat sown under them?—It is almost all rice lands underneath the tanks; the level of the water in the tanks now is below the level at which they could water the wheat lands.

42. *Q.* In the introduction of any new system of Government irrigation in the country do you think that the wants of wheat should be considered?—*Mr. E. R. K. Blenkinsop.* I should certainly think so, for wheat land bordering on rice land. In a year like the present irrigation would double the return of wheat. 10 Mar. 02.

43. *Q.* Do you think people would take water for wheat?—I am told so. They would also take water at the time of sowing. A considerable area is sometimes left fallow, because the ground is too hard.

44. *Q.* You say that the area irrigable is not all occupied by irrigated rice. Why don't they put wheat in the surplus land?—Because they infinitely prefer the dry rice crop.

45. *Q.* Where then do they grow wheat—in the upper lands?—No. Generally speaking wheat is grown in the neighbourhood of nallas. The highest land is red soil, then comes the yellow soil, then comes the mixture between yellow and black, and then the *kanhar* on which wheat is grown.

46. *Q. (Mr. Muir-Mackenzie.)*—Is *kanhar* a black soil?—Yes.

47. *Q. (The President.)*—If they generally prefer rice, why do they grow wheat?—Because black soil is not so good for rice; it is best suited for wheat; of all soils it is the worst for irrigation or rather requires it least.

48. *Q.* There does not seem to be much prospect of irrigating it?—No. In many of the projects that have been prepared there is wheat land bordering on the rice land and when rice is given a watering, water could be carried at the same time to moisten the wheat land for sowing. There will be a great waste of water if we are to irrigate wheat which is a long way from the bund.

49. *Q.* I find it somewhat difficult to see what the Government can do to encourage or develop wheat irrigation by Government works?—It is certain that any attempt to irrigate wheat could not be made to pay. The best system of protecting wheat is to make *bundhias* or high embankments.

50. *Q.* I thought you were in favour of irrigating wheat?—I am not in favour of projects solely in order to irrigate wheat. What I said was wheat would take water in some years.

51. *Q. (Mr. Higham.)*—In answer to Question 1 you talk of the area that is commanded by the tanks, and in reply to the President you said that the area recorded as irrigable by the tank is very much more than the area irrigated. How do you decide the area that is commanded by the tank?—Tenants themselves will tell you that. One can see at once how far the water can go and has gone.

52. *Q.* You put down the whole of the area that is potentially irrigable from the tank as irrigable?—Yes.

53. *Q.* Although it may never have been irrigated; I am speaking of the existing tanks?—We never record a field as irrigable unless it has taken water three times during the last 12 years, i.e., since the last settlement, except from the new Government tanks, where there has been no opportunity of opening them.

54. *Q.* The average area irrigated is much below that which you record as irrigable. In a year of considerable demand the whole area will be irrigated, I suppose?—Yes.

55. *Q.* When you speak of the average area, you speak of the area in ordinary years?—Yes.

56. *Q.* I do not quite understand what you were saying about the offering of water in new tanks for sale. Do you actually recommend the process of auction?—I do not recommend it as a permanent arrangement, but only as a means to find out what cultivators are prepared to pay for water.

57. *Q.* Then you would sell water to particular plots of land?—I would offer it to villages and the malguzar would answer for his tenants.

58. *Q.* You would not have much option if you make a tank in which there is only one particular area under command?—In all these 30 projects that we have had to investigate, the smallest project includes the land of four or five villages. I would offer it to different malguzars and see who would bid the highest.

59. *Q.* You would make the offer for a term of years and not for one year?—Just at present they would probably refuse to take it for a term of years or else offer a very low rate.

60. *Q.* You would simply offer it for one year. You would simply say “What would you pay for the water this year?”—Yes.

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61. Q. Suppose it were a wet year and nobody wanted it?—I should make a offer at the end of September or at any time when the water was wanted. If they were willing to make offers for water at the time of sowing in June, I should take them then. If they would not take it then, I would offer it to them later on.

62. Q. At any rate it would be an annual arrangement?—It would be at present.

63. Q. What I mean is, if a village made an offer, and it happened to be a wet year, it would not come forward again?—That of course is a reason why they are unwilling to take water for any term of years, because there is a possibility of their not requiring water at all. I propose only to offer the water, when they want it.

64. Q. Do you think they would be unwilling to go to the limit of one rupee?—I think that is the maximum that can be expected without compulsion.

65. Q. Another alternative is to let them take water when they want it and pay so much for a watering?—Yes. For that you would require more establishment.

66. Q. You say that they pay by the plough under the present system?—Yes.

67. Q. Do you think that there would be any advantage in fixing the water-rate by the plough rather than by the area?—You mean rather than by the village?

68. Q. Yes?—There would be considerable difficulty in doing it otherwise than by the village, because a man's plough or holding would be scattered all over the village and you would have to take the water, not to one place, but 50 or 100 different places.

69. Q. Suppose you have a village with 100 ploughs and you wanted to charge them Rs. 200 or Rs. 2 per plough; it would seem just as good to charge Rs. 2 per plough as one rupee per acre, and let them take water as they please?—I do not understand. Whom would you make over the thing to—to separate tenants or to malguzars?

70. Q. To the village as a whole. The demand of the village would be so much and they could divide it according to the plough?—That would be the usual way. The malguzar distributes the water to the tenants according to the plough.

71. Q. At present they have not got a water-rate?—There are half a dozen villages in which private owners charge water-rate.

72. Q. Do you think it would suit the economy of the villages if you charge them by the plough?—It is by far the most practicable way.

73. Q.* You have said once or twice that new tanks were made in famine in the Raipur district. Were any tanks completed?—Yes. About 400 new tanks were made and 900 existing ones were improved.

74. Q.* They were small tanks I suppose?—The maximum cost was about eight to ten thousand rupees.

75. Q. Were they for irrigation?—Yes.

76. Q. I thought the tanks made by the Public Works Department were not finished?—Most of them are incomplete—most of the bigger projects.

77. Q. They made 400 new small tanks?—Yes. That was done in the Civil Department.

78. Q. What did they do with them? Did they make them over to malguzars?—Yes. We enter in the Wajib-ul-arz certain conditions, one of which is that they should keep the tanks in repair.

79. Q. You don't charge them anything?—No.

80. Q. The only obligation is that they should keep them in repair?—I understand that as yet no definite conditions have been laid down regarding them. Up to now no payment has been taken. We merely tell the malguzars that they are responsible for the condition of the tanks.

81. Q. You say in reply to Question 30: "The Government tanks made in the famine are falling into disrepair and the bunds are being cut away by the rain. Malguzars should be required to see to this." Can you insist upon their doing the repairs?—If we make an entry in the Wajib-ul-arz at the settlement and the malguzar accepts that settlement, then he could be compelled to keep the tanks in repair.

82. Q. But the Wajib-ul-arz has not been prepared?—It has been prepared in the Drug tahsil, but not in others.

83. Q. Has anything been done with regard to these tanks?—Yes.

84. Q. Are they willing to undertake the repairs?—Yes. The tank is a free gift to them and can be taken away again. They have no right to it.

85. Q. If you have got a small tank which irrigates a few acres in one village only, how can you take it away from the village?—It will be simply classed as a Government tank.

The President.—It is on the malguzar's ground.

86. Q. (Mr. Craddock).—How do you record them?—As Government tanks.

87. Q. Do you not enter the name of the proprietor of the land on which they stand?—No.

88. Q. (Mr. Higham).—I do not see how you are to make a charge for water. You must have an establishment if you are to charge for water?—No, the malguzars would arrange it just as they arrange for their own village tanks.

89. Q. You don't anticipate difficulties?—No.

90. Q. You think that the malguzars will accept the responsibility?—They will certainly accept the responsibility of repairing it.

91. Q. They have not hitherto done it?—Because they have not been informed hitherto that the tanks are their property.

92. Q. You don't anticipate any difficulty when every thing is settled?—No.

93. Q. You say in reply to Question 33: "Black soil tanks without a back wall very soon silt up." I do not understand what you mean by a back wall which you say prevents silting up?—It is a small bank made perpendicular to the main bank. The water flows round the end or through a sluice some way up in the small bank, and the silt is left outside in the pocket formed by the main bank and the small bank.

94. Q. You say that in places where water is likely to be obtained at a depth of 15 feet or less in the month of October, the cultivators should, on the early cessation of rain, be compelled to sink wells and water their rice. How could you compel them to do anything? Who could compel them?—You can refuse to give them any assistance in the famine.

95. Q. The Deputy Commissioner could compel them to do it by using his influence?—Yes. In famines they give remissions, and he might say to them, "if you do not do it you won't get any remission."

96. Q. Would you consider that there is a very great field for making *tars* in nalla beds?—Yes.

97. Q. Will they fill the existing tanks?—Yes; there are a considerable number of *tars* that already exist, but most of them have been allowed to fall into disuse. They will have to be put in repair.

98. Q. What do you mean by disuse?—If the *tar* has fallen into disuse the bund will also have disappeared?—Yes. But there will be the trace of the passage by which water has been taken. There are facilities for making many more, provided that arrangements are made for making the bund in a village different from that which you irrigate.

99. Q. In the case of *tars* you can only irrigate very close to the banks of rivers?—They will be mostly limited to irrigating one village or at the most two villages.

100. Q. You cannot go far away from the river banks?—You can only go along the edge of the river?—You cannot go far from the river.

101. Q. I understand you recommend the Marowda and Khapri-Aranda projects as being very good?—Yes; I would place them first.

102. Q. If they had been made before the late famine, would they have done any good; would they have protected any large area?—The area that is absolutely protected by the Khapri-Aranda project is 7,000 to 8,000, and by the Marowda 4,000 acres.

103. Q. Was there very great distress in that part?—Yes. It is a very bad part.

104. Q. (Mr. Muir-Mackenzie).—In 1896-97?—In the year 1899-1900. In the year 1896-97 there was only a two or three-anna crop.

105. Q. (Mr. Higham).—You had a conference with malguzars at the Khapri-Aranda tank and they do not appear to have jumped at the all-round rate?—No. I did not find that they would willingly pay a constant water-rate.

106. Q. You say that no constant water-rate would be willingly accepted?—Yes.

*These answers referred to works by Civil agency only.

107. Q. Did you propose it to them?—I told them what the proposal was and enquired if they would pay.

108. Q. You think you ought to try the system of option?—I think so. They do not understand exactly what supply of water they would get. They are somewhat distrustful. But if in practice in the next few years, in years of short rainfall, they were given water and allowed to try and see the benefit of it, they would be willing to pay a fairly high rate.

The President.—That is the system you are pursuing with regard to the Public Works Department tanks that have been finished?—I do not think they have been offered the water at all.

109. Q. Is the water there?—There is only one tank that is practically completed. That is a small one—the Sorli tank. There one of the malguzars was willing to buy the water for Rs. 80.

110. Q. (Mr. Muir-Mackenzie.)—What is the area?—one twenty acres is the area marked as protected.

111. Q. He offered Rs. 80?—Yes.

112. Q. (Mr. Higham.)—I see a great many difficulties in the way of option after you build the tank. Would it not be possible to get people to agree to a constant rate if you enter into negotiations with them before you complete the tank or before you commence to build it? Suppose people were not willing to pay a constant rate, then you might say to them that you cannot build the tank. Would not the Government be in a stronger position then?—I do not think so, because most of the projects have not been commenced. There are about 30 projects, of which only 7 or 8 have been commenced.

113. Q. Taking those that have been commenced, is the Government obliged to complete them? After completing them, I suppose you will have to go to the people and ask them whether they will pay you for water or not? I suppose people are keen on having the tanks completed?—They do consider it a very serious matter. I did my best to persuade them to agree to a constant rate, but they would not agree to it.

114. Q. I suppose they would not agree to it as long as there is a chance of the work being completed?—In places where the works have not been commenced, I told them that their offers were absurdly low and that Government would not make the tank but they would not go any higher.

115. Q. How high did they go?—They would not offer any constant rate. They offered to pay 12 annas per watering when required. They may require three or four waterings, or even more in a bad year.

116. Q. (Mr. Craddock.)—Would you give them water free for one year and let them see the advantage of it and then ask them what they would pay?—If they require water in that year they would be quite ready to pay for it by the watering, but not otherwise.

117. Q. Don't you think they would pay more if they see the advantage of using water for one year?—Yes.

118. Q. (Mr. Muir-Mackenzie.)—I suppose whatever doubts there may have been about the value of tanks and in the year 1899-1900, there can be no doubt that if they had been constructed they would have been of enormous value in 1896-97?—Yes, as they have been this year. I had special enquiries made as to the area irrigated by these new works.

119. Q. I mean old works. Your existing tanks failed in 1899-1900?—Yes, to a great extent, because we could not get any crop with less than three waterings.

120. Q. In the year 1896-97 they were availed of and were of great value in saving crops?—Yes.

121. Q. Nevertheless it was a year of considerable famine. Wherever there was any tank or *tar* to irrigate land it was of great value?—Yes.

122. Q. Have you ever heard that in Khairagarh and Nandgaon, where they used to grow cotton, they are now growing rice?—Khairagarh and Nandgaon are Feudatory States and not part of this district. In this district they used to grow such cotton as was needed for local use, but the conditions were not suitable, and directly the country opened up, they ceased to grow it.

123. Q. In this case the soil was fairly well suited for cotton?—Yes; but the rainfall was too heavy.

124. Q. My point is: I want to bring out the fact that there are circumstances under which rice on black cotton soil may prove more profitable or has proved more profitable than cotton?—Cotton was grown in a

poor way. They only grow such cotton as was necessary for local use. A Calcutta firm asked us to associate with them in encouraging further cultivation of cotton, but it was decided to await the result of the experiments being made in Nandgaon and Khairagarh.

125. Q. At any rate we have heard that in Nandgaon and Khairagarh, where there was no competition from outside, they did find it sometimes useful to grow cotton on a soil on which they now grow rice. Have you got any figures to show to what extent they did it?—I do not know the figures.

126. Q. With regard to the *lakhbata* system, you say that it discourages tenants and malguzars in extending irrigation. I can understand it discouraging the tenants, but I cannot understand how it discourages malguzars?—The rent given is so low that the increase in the rent would not pay a moderate interest on the cost of the tank.

127. Q. I do not understand: even if there was no *lakhbata* system, the question of rent would still hold?—It would pay the malguzar better if he could irrigate his own land. It is the *lakhbata* system that prevents him from irrigating his own land as he has not got enough land in one block.

128. Q. You say in reply to Question I:—"In the present settlement I have endeavoured to reward those who have made improvements by exempting from the irrigated factor not only fields watered by the improvement, but all the irrigated land they hold in the village." If you pursue that policy how are you going to give rewards for further improvements? Suppose that a man puts a tank in another part of the village, you will find you have already given him exemption for that?—There is a limit of Rs. 15 per acre under the first improvement on the land.

129. Q. You rely on that not to get too high above the mark?—Yes.

130. Q. Supposing it is desired to charge a water-rate for a new or improved tank and for a fresh irrigated area, what is the machinery that you would utilize? Is there any machinery for taking an occupier's rate from the tenant who takes the water direct or must you take it from the malguzar?—It would generally be arranged with the malguzar, or else you would have to employ a collecting agency.

131. Q. Would you fix the whole charge on the malguzar or would you fix it on the tenant?—The malguzar would not accept the responsibility where he cannot control his tenants; but in many villages his relations with the tenants are very amicable, and then by far the simplest way is to entrust the collection to the malguzar if he would accept the responsibility.

132. Q. Would it not be practicable to impose the responsibility upon him? It depends upon whether he chooses to accept it or not?—Yes.

133. Q. The simplest way is to charge the tenant direct and give a percentage to the malguzar on the amount collected?—Yes; if he requires that inducement. In many cases he would not require it.

134. Q. Would not the malguzar be all the more ready to accept the responsibility as he would not like the Government to interfere between him and his tenants?—That is so in many cases where the relations are amicable and where they like to keep out Government interference. But in certain cases, where there is trouble, they would like the Government to interfere.

135. Q. How would you charge a village? Suppose 100 acres are protected, you would levy the whole charge on the village?—Yes.

136. Q. If you put a rate of 12 annas or one rupee per acre you would make the malguzar responsible for Rs. 75 or 100 as the case may be?—Yes. He will distribute the payments among the tenants according to the lands held by them.

137. Q. With regard to the statement that the area recorded as irrigable far exceeds the area actually irrigated, have there been any complaints about the area being recorded in that way?—No, because we record the area as irrigable according to the statement made by the people themselves. There are occasional complaints about it. The Settlement Officer always sees the villages and cuts down, if necessary, the area marked as irrigable by the Revenue Inspectors.

138. Q. Sometimes Revenue Inspectors mark the area irrigable to a greater extent than what is really the case and this is checked by the Settlement Officer?—Yes.

139. Q. I am asking this question with reference to a random statement made by one of the witnesses who said that the irrigable area is entered recklessly?

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—The question of irrigable area is made a special point of by the Settlement Officer.

140. Q. He is careful about it and sees that the irrigable area is not excessive?—Yes.

141. Q. How do you account for the fact that the actual area irrigated does not come up to the area irrigable?—Chiefly because in many years they do not use the tanks. They have to cut the bund to take the water and they do not take the trouble to do it.

142. Q. Is the area that gets benefit by percolation included in the irrigable area?—It depends on the discretion of the patwari. In some cases it is included while in others it is not.

143. Q. I mean to ask whether it is included in the settlement?—Yes; we always include percolation.

144. Q. There are two kinds of irrigable area recorded in the Settlement—area irrigable by percolation and area irrigable by tanks direct?—Yes.

145. Q. The area under a tank varies considerably?—Yes.

146. Q. Percolation is not shown in your annual returns?—Not generally. In some cases where water is very deep they are entered in the annual returns as irrigated, but a good deal of percolation is not put in the annual return.

147. Q. I may take it that special pains are taken to see that the area that actually pays for irrigation is not in excess of that which receives water when it is required?—Yes.

148. Q. It is based mainly upon the statements of the people themselves?—Entirely; except in cases where the fact is concealed with a view to get a reduction of rent. If a tank be opened there will be clear marks of its having been opened and you cannot conceal those marks as there is a certain amount of depression.

149. Q. In former days the construction of tanks was encouraged by the grant of *tukum*?—I do not know very much about that practice. Lessees who held a village for short terms might, on the construction of a tank, enter a claim for a longer tenure.

150. Q. Were they not actually given bits of land revenue free?—I know very few cases of that. I do not think it was a very common practice.

151. Q. You say in your note: "I heard of many cases in the famine of 1899-1900 where, with water readily obtainable at a depth of 5 to 6 feet, cultivators did not dig wells till too late and obtained only one-fourth of the crop they might have had." Did you distribute *takavi* for improvements in the famine?—No; not for improvements. All Civil works were carried out by Government.

152. Q. You distributed *takavi* for cattle and seed? No. I was the Settlement Officer and I had 4 Charge Officers who had the actual distribution of seed money.

153. Q. What did you do? Had you no connection with *takavi*?—I checked the disbursements made by the Charge Officers.

154. Q. Suppose you had had plenty of money given you at an early stage of the famine, with directions to disburse it for the purpose of constructing small wells and *kachha* wells and you had done what you could to induce the people to take the loans, don't you think you could have induced them to make some *kachha* wells and thereby save their crops?—I think so. In many cases it requires Government interference to induce them to make *kachha* wells in September.

155. Q. At any rate a strong lead would have induced them to do something of that kind?—Yes.

156. Q. You say: "In former days when a tenant became wealthy, his chief ambition was to make a tank and plant a grove." How does he spend his money now—on money-lending?—Chiefly on money-lending and litigation. Weddings are far more expensive than they were before.

157. Q. Has the standard of living risen a good deal?—Not much. There are no visible signs except weddings and the amount that they can afford for litigation.

158. Q. In reply to Question 4 you say that "the existing provisions for exemption are sufficiently liberal, but rents are so low in Raipur that any exemption is trifling compared with the outlay." That conflicts with what was mentioned by Mr. Lall about sugarcane, that the cultivator thinks it worth his while to stop his sugarcane cultivation in order to obtain these rates. If the rates are so low that it

is not worth his while to get exemption he would not trouble himself to stop it?—There might be the feeling that the rate might be increased. They might be afraid of the rate. As a matter of fact the rate on sugarcane is only double the normal rate.

159. Q. Is it only double the dry rate?—Yes. It pays the highest wet rate, Rs. 1-4 or Rs. 1-3 per acre. But they will pay Rs. 8 or Rs. 10 an acre for water.

160. Q. You mean that the rate is so low that all theoretical considerations will disappear? Another point with reference to improvement is, if the water-supply from *tars* were improved, would the *ryots* who enjoy the existing supply object to other *ryots* being given a part of the increased supply?—A case would only arise if irrigation were carried beyond the limits of the village. So long as it is within the limits of a village every *ryot* is entitled to equal rights in the matter of irrigation.

161. Q. If it went to another village or if even some were given to a village in the way would the *ryots* of the village object?—I do not think they could object.

162. Q. They do object to it in Bombay. They say: "We alone have a right to this water and nobody else has a right to it." They objected and the objection was upheld by the Courts. You have had no experience of such cases?—No.

163. Q. In answer to Question 23, clause I, you say: "I can only call to mind two permanent bunds of masonry fitted with sluices in this district." Do you think it will be a good thing if the Government were to help people to make their *kachha* bunds into permanent bunds of masonry?—I think so; because in good years they allow the earthen bunds to fall into absolute disrepair.

164. Q. Are not these bunds washed away by rain every year?—Not every year. These bunds last two or three rains, but if there should be heavy rains they would breach.

165. Q. Is there any additional rate charged for the land irrigated by these bunds?—No rate beyond the irrigation rate.

166. Q. You charge a wet rate on lands irrigated from these bunds?—The bunds invariably supply the tanks and increase the catchment area of tanks. There are a few bunds that simply turn the water into fields, but they are not of much use.

167. Q. If you were to forego the additional rate it would be a substantial encouragement to people to build more of these bunds?—I do not think it would make any difference.

168. Q. You mean that the rate is so low that it would hardly make any difference?—Yes.

169. Q. You say in the next clause that masonry sluices had been allowed to fall into disrepair by the people?—Yes.

170. Q. Are you able, with the law as it stands, to put sufficient pressure on the people to induce them to keep their works in repair or do you think it is necessary to strengthen the law?—I think if the authorities pay attention to the matter the people would put them into repair.

171. Q. You say they neglect them?—When one goes and sees them one can compel the men to put them into repair.

172. Q. Can you do it without a condition being inserted in the *Wajib-ul-arz*?—If the tanks are made over to *malguzars* we would require them to keep to the conditions of the *Wajib-ul-arz*. In the *Drug tahsil*, the only place where we are writing up the *Wajib-ul-arz*, no sluices were made.

173. Q. In Raipur has the commencement been made?—The Settlement has been stopped on account of famine.

174. Q. When will the Settlement come on?—It has been given three years certain rest. It may not come on for five or six years.

175. Q. Till then you would not be able to put any pressure on them to put these works in repair?—You cannot compel a man to do it if he refused it.

176. Q. You do not think he would refuse it?—No.

177. Q. You do not require any strengthening of the law to make them do it?—No. In their own interest they will do it. They are extremely careless and lazy, but, at the same time, they pay considerable attention to any executive order.

178. Q. An executive order would be sufficient to induce them to put the works into repair?—Yes.

179. Q. And the repairs are such as they could make themselves?—Yes, they are quite simple.

180. Q. Have you come across any instances of breaches having occurred in tanks. Mr. Carey in his statement says that breaches occurred in 1896-97?—I did not come across any then. But in regard to the new tanks which were made in the recent famine of 1899-1900, I know seven or eight cases in which breaches occurred. In some of the large tanks sufficient provision was not made for escapes and when there was heavy rain in succeeding years, seven or eight of the tanks were breached and spoiled.

181. Q. You have no information as to the causes of the existing tanks breaching?—No.

182. Q. Did the people repair those breaches?—The only cases of breaches that I know are those in which they are still in the same condition. That is how I know they have breached.

183. Q. Is no strengthening of the law required to make them repair the tanks promptly in such cases?—I do not quite know how it could be done.

184. Q. If a man chooses to let his tank go into disrepair is he not bound by the Wajib-ul-arz to keep it in repair?—No.

185. Q. Can you not insert a condition in it to make him keep the tank in repair?—We could bind the malguzar to keep his tank in repair, but not his tenants.

186. Q. Don't you think that by legislation you can compel them to repair the tanks?—We cannot compel them. We have provided in the revised Wajib-ul-arz that the Government or the malguzar should be allowed to step in and repair a tank, when it is not repaired in time, without injuring the rights of the man who constructed the tank.

187. Q. You can, by means of such a clause in the Wajib-ul-arz, compel them to repair?—You cannot compel them to repair them. Formerly a man who owned a tank would not allow anybody else to repair it for fear that his rights would be disturbed and the tank would pass into the hands of those who repair it. All that we now provide in the Wajib-ul-arz is that other persons should be allowed to repair the tanks and the man who constructed it should retain his possession of it. It does not compel anybody to repair it.

188. Q. By that condition you can ensure the tank being kept in repair?—I would not go so far as to say that.

189. Q. You do not think it necessary then to have the law strengthened?—The Government could repair the tank if it chose. You could not compel anybody else to repair the tank. That clause of the Wajib-ul-arz is only intended to remove an obstacle in the way of repairs being carried out by any one who likes to do them.

190. Q. Don't you think it is advisable to have some provision to secure the repairing of these tanks?—To compel a malguzar to repair the tank?

191. Q. In this case it would be the tenant?—I do not think it would be possible, because being a tenant he does not get any advantage.

192. Q. Is not his right over the tank subject to the rights of the people having land below it?—The clause in the Wajib-ul-arz provides that those who have lands can themselves undertake the repairs and the malguzar would not be allowed to put any obstacle in their way.

193. Q. In reply to clause 3 of Question 23 you say, "In a year of ample rainfall irrigation is but little resorted to. The area recorded as irrigated from tanks in 1888-89 was only 2,413 acres or 00.16 per cent. of the rice area, and probably most of this was by percolation and not by cutting the bund." Surely, in a good year, the area irrigated by percolation must have been exceedingly large?—Yes. The entry of percolation has hitherto been left more or less to the discretion of patwaris; the area irrigated by percolation is at no time very large.

194. Q. I understood from Mr. Sly's statistics that the area irrigated refers to the area irrigated otherwise than by percolation. But I understand from your answer to clause 3 of Question 23 that most of these 2,413 acres was by percolation?—I use the word "probably."

195. Q. That would show that the annual returns did cover the area irrigated by percolation?—They do include percolation, when there is a large amount of water remaining in the field at the time of the Patwari's girdawari.

196. Q. Is the area that receives water by percolation better off in an ordinary year than the land which

does not receive such water, or does it get too much water?—The only damage that is done by excess of water to rice is when there is too much water soon after germination. In the percolated areas we get the heaviest yields up to 3,500 lbs.

197. Q. Do you think it would have a good effect or a bad effect upon cultivation in a district if we made tanks water-tight so that it could not percolate, and if all the water were to be taken by channels through a sluice or an outlet cut in the bund?—I think it would have a bad effect.

198. Q. There would be some economy of water if we provide proper outlets?—I never thought of it. Very often they do not open the tanks.

199. Q. If you had outlets would it not be better?—If you put masonry sluices so that the tanks could be easily opened, they would benefit a larger area. But I do not think that any amount of watering will ever give a yield equivalent to the yield that we get from percolated areas; from opening the tanks one never gets a yield equal to the yield of percolated areas.

200. Q. I suppose it is the lowest and the best situated land that gets water by percolation?—It is chiefly the land close to the bund.

201. Q. The value of the rice in the country has no doubt been greatly increased by the introduction of railways?—Yes.

202. Q. They export a good deal more rice now?—Yes.

203. Q. One witness said in Nagpur that it had the effect of reducing the stock in villages?—Stocks are far less now.

204. Q. So that the capacity of the people to resist a famine has become lessened?—Yes. They get money and use it in other ways.

205. Q. Who gets the benefit of the rise in prices? Do the tenants get it or does it go to malguzars?—I dare say that very small tenants do not get much benefit, because they have no surplus. But any tenant who has a plough or a plough and a half will benefit by it.

206. Q. Is it the practice of the people to empty the tanks practically for the *biasi* operations?—I do not know of any case of a tank being opened for *biasi* operations even in the worst famine of 1899-1900. I do not know of a tank being opened, although *biasi* operations have sometimes been delayed from three weeks to a month.

207. Q. Are you certain that *biasi* cultivation increases the yield?—They always say so and I think it does.

208. Q. In answer to Question 28 you say, "Tenants pay for water according to the number of ploughs of land they hold." Do you mean by this that a tenant, if he irrigates one-fifth of an acre under a tank and holds a plough, would pay Rs. 2 for the irrigation of that one-fifth of an acre?—Payments are made according to the acknowledged number of ploughs in the village. The village has been divided from ancient times into so many ploughs and the tenants generally hold irrigated land proportionate to the number of ploughs they hold.

209. Q. Would he pay on the plough?—Yes. But that implies that he has some share under the tank. The system is not very exact.

210. Q. What will the rate come to per acre and is the charge upon the ploughs so adjusted that it gives Rs. 2 per acre of the area watered?—People generally come to an agreement with the man who holds the tank as to the amount to be paid for water and the water is thereupon distributed among them.

211. Q. Is the payment distributed according to the acreage watered by the tank or according to the ploughs held by the tenants?—According to the ploughs they hold.

212. Q. They get their share of water corresponding to the number of ploughs they hold and the distribution is effected rateably over the land, as the land is proportionate to the ploughs?—Yes.

213. Q. With regard to wells, in reply to Question 34, you say, "Permanent wells are not used for irrigation. A number of such wells have been constructed by Government to improve the drinking supply and check cholera, but the people will not generally use them till all the tanks are dried up and most of them have fallen into disrepair." May one infer that the water-supply of permanent wells lasts longer than that of tanks?—Yes.

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214. Q. Can you tell me at what depths water is generally found?—It varies very much indeed. One can hardly speak of two adjoining villages in the same way.

215. Q. Are there plenty of villages in which water is found even in a year of famine at a moderate depth?—I think water can be got at moderate depths in a vast majority of villages. In places situated in valley formations one may get water more easily. In a great many of the villages you can get water within 15 to 20 feet.

216. Q. These wells dug by Government contained water after the tanks had gone dry?—Yes. The wells are made where the existing tanks have a poor supply in order to supplement the supply therein.

217. Q. If that is so, don't you think that well irrigation can be increased with considerable advantage from the point of view of protection?—I should say most distinctly. In examining Public Works projects I had the depth of water recorded in the area commanded by a project. It seems to me that in a year of drought people should be required to irrigate from wells. Government should ascertain the depths at which water is obtainable in September or October; and if it is then easily obtainable that would be a reason for not extending any sort of protection.

218. Q. At the same time you do not think it is necessary to encourage the construction of permanent wells?—No. Temporary wells cost very little. In the famine of 1899 as many as 50 or 60 wells were made in one village to irrigate at the outside 2 or 3 acres; and that is where the water was within 6 or 7 feet of the surface.

219. Q. All the areas which are under garden crops are irrigated entirely from temporary wells?—Yes, or nallas. The temporary wells do not always fall in every year. They are called temporary wells because there is no masonry work about them.

220. Q. Is the irrigation by mote?—The local name is *tera*. It is a lever lift.

221. Q. Do you think the people would not be induced to convert these temporary wells into permanent wells if they were given a grant?—They would not convert them for rice.

222. Q. I am speaking of garden crops. Where a man has made a temporary well for garden crops and the Government gave a grant to induce him to convert the temporary well into a *pakka* well, would he do it?—I do not think so. The cost of these temporary wells is very small from Rs. 2 to 5. They also get water by bunding *nallas* to irrigate garden crops.

223. Q. Do you think that the embanking of fields either for rice or for wheat might be usefully done by the employment of famine labour?—The work is very useful, both embanking and levelling or terracing, but it would be difficult to control.

224. Q. Would it be a more difficult work to control than any other kind of village work?—Yes, distinctly.

225. Q. Why?—Because the work is so scattered, whereas in a tank, the work is concentrated. It is certainly impossible for superior officers to check the work. If inferior officers are dishonest, there would be no control at all.

226. Q. Mr. Lall did not take so serious a view?—But he wanted it handed over to Civil Officers. In the first famine, I issued loans for this, but I could not satisfy myself as to whether the money was fully spent on works, though a good deal of trouble was taken. After giving the money in loans, I used to go round once a month to find out if the money had been spent on the works, but it was impossible to find out if it had been spent, because the embankments were very small works, and scattered all over the village.

227. Q. I think a certain amount of similar work was done in the Jubbulpore side?—That I do not know, if we give loans for embanking to villages where the *lakhabata* system prevails, you will find that the fields there will be scattered. But in Jubbulpore the fields will be close together.

228. Q. In the first famine a good deal was done for tank improvement by means of these loans?—Yes.

229. Q. It was not done in the second famine?—No.

230. Q. What was the reason of the change of policy?—The second famine came so soon after the first that a great many of the loans issued in the first famine were still outstanding and they decided to make a clean sweep of the thing and have everything done by Government. There was also considerable difficulty in getting *malguzars* to take up the loans.

231. Q. Were there not *malguzars* who had not taken up loans in the first famine and who might have taken loans in the second?—There were some left. In the first famine many refused point blank to take up loans.

232. Q. Do you remember the amount of loans advanced in the first famine?—I could only tell you for the part I was in charge of. I left the district in March and I do not know the district figures.

233. Q. I find that Rs. 23,700 is the amount advanced for land improvement?—That figure is not correct. Orders were issued to start with *takavi* loans. But after a short time we were ordered to issue famine loans with remission of one-fifth to one-fourth of the amount with the view of inducing people to take loans. That amount was not included in these figures.

234. Q. Can you give me any idea as to the amount? Will it be a couple of lakhs?—It will be more than that.

235. Q. Five lakhs?—I cannot remember the figure even for my own charge. Up to the time I went away, I issued Rs. 60,000 or 70,000.

236. Q. (Mr. Rajaratna Mudaliar.)—In the case of new tanks constructed by Government, you propose to throw the responsibility of maintaining them upon *malguzars*. How do you propose to enforce that responsibility?—You merely ask the *malguzar* when you are announcing the village, whether, if the Government agrees to give the tank, as I understand it does, he would accept the tank, on the condition of making the necessary repairs. If he refuses it, the Government would not give him the tank.

237. Q. The Government will continue to maintain it?—I presume so.

238. Q. Suppose a *malguzar* consents to take over a tank and maintain it, you would give him a share of the irrigation revenue?—In the natural course he gets a share of the revenue, because the land below belongs to his tenants and he gets half the rents and the Government gets the other half roughly.

Mr. Muir-Mackenzie.—That means he gets only the rent. What Mr. Rajaratna Mudaliar means is whether he would get any portion or part of the revenue that goes to Government.

239. Q. (Mr. Rajaratna Mudaliar.)—What I mean to say is that considering that the tank was constructed entirely at the cost of Government, would the Government refuse to give him any share of the revenue?—Under the tank we mark the area that can be irrigated and that land is charged wet rate; and of the enhanced rate the Government takes half and the *malguzar* the other half.

240. Q. As regards the levy of water-rate you said that this should be done by the villages as a whole and that it should be left to *malguzars* to distribute the rate. Is not the charge for water merged in the rent?—I was speaking of the new projects of the Public Works Department, and of the best method of collecting the water-rate in regard to them.

241. Q. Why should not the present plan be followed of assessing at a consolidated rate the fields which are irrigable?—The assessment would not come to anything like what is required to make the projects pay. The outside limit for increasing the tenants' rent is 50 per cent.

242. Q. You think that under the proposed rate you could take something more?—Yes; I would not construct a tank unless they agree to pay considerably more. Tanks already begun can be utilized to find out what they are capable of paying. If they refuse to pay, I would not go on constructing tanks or projects of any kind.

243. Q. Under the existing conditions they would not agree to such terms and the result would probably be that all your protective works would have to be shelved?—You can get more than your rent because they have agreed to pay 12 annas.

244. Q. Would you levy the full charge of water-rate at once or would you levy it in annual increments by levying one-fourth the rate in the first year, half in the second, three-fourths in the third and so on, and thus working up to your full rate within four or five years?—Personally if I had to arrange the matter I should allow them to take water free for two years of short rainfall, so that they might understand the advantages of water and then I should require them to pay rates that would make the projects pay, or if they refused to pay such rates I would refuse to give them water.

245. Q. Mr. Lall said that tenants discontinued the cultivation of sugarcane in order to escape a high

assessment at Settlement. Is there no reduction of assessment granted during the currency of the Settlement if a tenant gives up sugarcane cultivation and takes to rice cultivation?—No; there is no additional assessment on the cultivation of sugarcane. Very often malguzars and ryots cultivate one plot together. There is no separate assessment on the crop.

246. Q. In that case why should the tenant stop sugarcane cultivation in order to escape enhancement at Settlement?—I presume it is because they do not know what the Government might do.

247. Q. You charge a higher rate on sugarcane than rice?—It is not included in the assessment. I do not know even a single case where sugarcane has been assessed as such. Sugarcane has almost died out entirely in the parts that I know.

248. Q. (Mr. Muir-Mackenzie.)—I thought you said the rate was Rs. 2?—They pay a water-rate of Rs. 10.

249. Q. You said that it is charged a higher rate?—I said that in the Settlement it is charged the highest wet rate.

250. Q. (Mr. Rajaratna Mudaliar.)—That is the charge when sugarcane is grown?—There is no separate assessment on sugarcane lands. There is so little sugarcane cultivation that hitherto it has been disregarded practically.

251. Q. Suppose at the time of the Settlement the land is assessed as rice land and a few years later the tenant cultivated sugarcane, would he be liable to a separate charge for that?—Not by Government, certainly.

252. Q. I mean by the malguzar?—The malguzar can under the Tenancy Act enhance rents from time to time. But he could not get any enhanced rate from the tenants on a change of cropping unless they agreed to give it. The chief requirement for sugarcane is the supply of water, and the malguzar may charge for that supply.

253. Q. Suppose in a village in which you are carrying out a Settlement there are lands under sugarcane and under rice. What rate would you fix on these lands? Would you fix the highest rate on sugarcane?—Sugarcane would be assessed at the highest rate.

254. Q. Would not the difficulty referred to by Mr. Lall be removed if you assess all irrigable area at the rice rate and leave it to malguzars and to Government to enhance the rate if sugarcane or any other valuable crop is grown, say by 50 per cent. or cent. per cent? Would not that obviate the difficulty?—What is the difficulty?

255. Q. He says that the fear of enhancement at the Settlement has caused the tenants to discontinue sugarcane cultivation. What I suggest is: treat all land as rice land, and whenever sugarcane is grown charge 50 per cent. or 100 per cent. extra. There will then be no fear of enhancement?—There has been no enhancement for sugarcane.

256. Q. You said just now that when a Settlement is carried out you would fix the highest wet rate on sugarcane and a lower rate on rice lands. Then the assessment on sugarcane land would be permanent during the currency of the Settlement. What I suggest is that the sugarcane land might be assessed at the rice rate, leaving it to the malguzar or the Government to charge the enhanced rate whenever sugarcane is grown?—If sugarcane is grown it wants a good deal more water than rice. I should not charge anything at all for it.

257. Q. I am not speaking of the charge; I am only suggesting a method to remove the fear of enhancement. Are lands benefited by percolation assessed at a higher rate than lands irrigated by cuts?—I thought of making it a separate class of irrigation, but the system here is so complicated that I did not think it advisable to introduce it.

258. Q. Then they are assessed in the same way as lands irrigated by cuts?—Yes.

259. Q. With regard to the question asked by Mr. Muir-Mackenzie about tanks, has the condition of tanks deteriorated to such an extent as to call for legislation on the part of Government to enforce the condition on the malguzar to keep them in repair?—Many of the tanks are more or less ornamental tanks.

260. Q. Has the capacity of the tanks, owing to the bed being silted up, been so considerably reduced as to render it impossible to irrigate the area commanded?—That is so in regard to some tanks. They are of no use in years of deficient rainfall.

261. Q. Do malguzars find any difficulty in enforcing what is called customary labour on the part of their tenants in carrying out petty repairs to tanks?

—It depends a great deal on the different classes of tenants that you have to deal with. The ordinary Hindu tenant is very well behaved and with him the malguzar is able to carry out repairs and construct tanks. Chamars do not do so so easily. Malguzars have no control over them.

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262. Q. If legislation is undertaken to compel malguzars to keep the tanks in repair, should not malguzars have the power to enforce customary labour on the part of their tenants?—If we want them to co-operate with him in carrying out repairs and things of that sort, certainly he must be given that power. It is to the interest of everybody to co-operate with each other in carrying out the repairs to tanks.

263. Q. I suppose you have no details of loans granted for wells and tanks?—As far as I have had to give loans, they were entirely for tanks. At that time, viz., 1896-97, I was an Assistant Commissioner here and I did not see the District Statistics.

264. Q. Do you give loans in instalments, or give the money in a lump once for all?—We issue it to them by instalments, so as to check the expenditure, to see if they have applied the money properly.

265. Q. Before the second instalment is paid, do you take care to check how the first instalment was utilised?—Yes.

Mr. Craddock.—You mean in the famine?—Only in the famine.

266. Q. (Mr. Rajaratna Mudaliar.)—In the appendices to Mr. Sly's statement, no interest is shown, and the only conclusion to be drawn from it is that no interest has been charged. Is that so?—Interest may not be shown there as it was remitted in some cases. I cannot tell you what measures were adopted, as I was transferred to another district.

267. Q. (Mr. Craddock.)—According to the returns given at the end of the famine, they were 1,355 village tanks which were constructed, improved or repaired. I think your figures agree with that. You say there were 400 new ones?—They are practically the same.

268. Q. According to the Deputy Commissioner, Captain Macnabb, 200,000 additional acres were made irrigable. That is an exaggeration?—That is very much exaggerated.

269. Q. Have you made any estimate of the additional area irrigable on account of famine works?—Enquiry was carried out in connection with this Commission as to the actual area irrigated this year. I have prepared a statement and sent it in to the Commissioner.

270. Q. (Mr. Muir-Mackenzie.)—Would it not be better to put in the report, Sir?

The President.—Yes.

[Witness was desired to file a copy of the report, which he agreed to do.]

271. Q. (Mr. Craddock.)—You know the total area? In the khalsa 334 new tanks were constructed by Civil agency at a cost of Rs. 6,24,733 or Rs. 1,840 per tank. Of these, 86 are reported not to have filled up, presumably because the sites selected were bad, and 136 were not opened for other reasons, of which the most important are that the water was kept for *nistar*, that the malguzar and cultivators thought that they would have to pay a water-rate for the water if they used it, and that they did not know that they could make use of the Government tank, or that the water escaped by percolation and there was no necessity to open the tank. The remaining 111 were opened and irrigated 4,280 acres or about 38½ acres each, which is equal to Rs. 50 per acre.

272. Q. (Mr. Muir-Mackenzie.)—Is that the famine rate or the ordinary rate?—The famine rate.

273. Q. (The President.)—What is the total amount spent?—The number of tanks enlarged or repaired was 921 at a cost of Rs. 17,27,987, or an average per work of Rs. 1,875; 448 were not opened for the same reasons as I have detailed before; the highest area irrigated from these tanks before improvement was 5,186 acres. 473 were opened and irrigated an area of 24,394 acres or about 51 acres each, with a cost of Rs. 42 per acre. The highest area ever irrigated by these tanks prior to improvement, that is taking the maximum for each in any year and not the maximum for all the tanks in a given year, was 14,818 acres. It may be safely taken that the maximum for these tanks in a given year was not more than 12,000 acres and that therefore the irrigating capacity has been doubled.

274. Q. The proportion of failures of these tanks to the number of new tanks is about one-fourth?—

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Yes. Many of them are incomplete. All works were stopped as soon as the rains commenced.

275. Q. (Mr. Muir-Mackenzie.)—What do you think about these incomplete tanks? Do you think they ought to be completed as soon as possible?—Some of them are useless, but some of them will serve a good purpose if completed.

276. Q. Would you be prepared to advise which should be completed?—I cannot say unless I go round myself.

277. Q. You have no materials to advise at once?—There are a considerable number of them. There are about 143. I could not offer an opinion worthy of acceptance.

278. Q. That was all done by the Civil Department?—Yes.

279. Q. Did people pay anything for the additional area made irrigable by these works?—Nothing.

280. Q. (Mr. Craddock.)—These tanks were constructed in the famine, and you had to select the most likely sites. There was no question of land acquisition about them. Was there?—There was no land acquisition. They were only too glad to give up any cultivated land for us to make tanks.

281. Q. Had you any complaints?—We had afterwards; I asked my men in my division to take *razinamas*; in cases where they did not take them, there were complaints.

282. Q. Had you ever to abandon any village project because people would not give *razinamas*?—Not in this famine.

283. Q. Were there not some obstinate tenants among the Chamars?—There were men who gave some amount of trouble, but in this famine there was no trouble, though in the first famine there was.

284. Q. If there was no pressure of famine at the moment it would have been difficult to get sites?—Yes, we would not have got land at all.

285. Q. You would have had to acquire it?—Yes. In regard to Public Works Department tanks they had to acquire land.

286. Q. Is no record maintained of the ownership of the bits of land taken up for the tanks?—Yes. They are given in some of the papers.

287. Q. But they will never be preserved. No one would know to whom it belongs. Whom have you entered as the proprietor of the land?—I have entered the land as under water.

288. Q. You must put the proprietor down?—I have entered it as a Government tank.

289. Q. (Mr. Rajaratna Mudaliar.)—I suppose formerly these patta lands were in occupation of the tenants before you constructed the tank?—Yes.

290. Q. You have not acquired the land?—No. They gave up the land willingly in consideration of the Government constructing tanks.

291. Q. Was any compensation given or was there any exchange of land?—No. They were too anxious to have the tanks made. I had countless applications for having tanks made.

292. Q. (The President.)—You took a *razinama* from them?—Yes.

293. Q. (Mr. Rajaratna Mudaliar.)—Would you allow the old tenants to cultivate the bed when the tanks run dry?—They do not run dry. A case has not arisen. We had to dig up all the fields to make the embankment and there is no trace remaining of their fields.

294. Q. (Mr. Craddock.)—Do you think that the security of the district has been appreciably improved by these tanks?—I think so, most distinctly. I think there would have been considerably more trouble this year if these tanks had not been made.

295. Q. Do you think that there is any particular tract where people are much more ready to make improvements and use irrigation than in other parts?—It is more a question of caste than of tracts. Absolutely the best part is the 30 or 40 Kurmi villages in the south-west of the Singa tahsil.

296. Q. Is any of these projects situated in the Kurmi villages?—There is the Khapri-Aranda project. The Kurmis are far more likely to be reasonable than Chamars.

297. Q. The two projects you now select—the Marowda and Khapri-Aranda—are in the Drug tahsil. In your note, in selecting the area where you would urge irrigation, you put Laon pargana as the first. You would rather have these other projects?—I have never been in the Laon pargana. From the point of view of the soil you could not have anything worse than Marowda and Khapri-Aranda.

298. Q. I suppose if you made the Khapri-Aranda project in the Kurmi tract, people would take keenly to it and begin to irrigate. Would not this have the effect of spreading irrigation?—Yes, I think so, if you assist them. I have not any hopes of Chamars taking it up. If the matter is taken up and the advantage of irrigation is practically demonstrated, it might have some effect on malguzars and others in the district. Unless you diffuse the knowledge gained in that way, there will not be much hope, because some malguzars do not know the names of their next-door villages.

299. Q. You do not think that any tendency to make improvements has been checked for fear of assessment?—No.

300. Q. Your wet rates are small as compared with your dry rate?—Yes. We take no wet rate in gabhar, that is low-lying land. On the slopes the rate varies according to the class of the soil. In black soil we take 50 per cent., in yellow soil 60 per cent. and in bhata soil 100 per cent.

301. Q. Do you agree with Mr. Lall that people would pay more readily when water is brought to their low-lying lands than to the high lands?—No. The high-lying lands require water oftener.

Abstract of the information collected as to tanks newly constructed, enlarged or repaired, during the famines of 1896-97 and 1899-1900 in the Raipur district.

This enquiry, extending over 1,420 works, was made hurriedly in the month of October 1901, so that the information might be ready in case the Irrigation Commission should visit the Central Provinces at the commencement of its tour. Only a fortnight was allowed for the collection of the information, and when the registers were submitted to me in November I found them, not unnaturally, incomplete in many respects, but more especially, because many of the tanks were actually opened after the date at which the information was collected. I therefore ordered further enquiry and have only recently received the last returns, the Inspector of the Bhimbori Circle being especially remiss. Even now, however, the important additions made to the irrigated area due to *pajra* or percolation from newly-constructed tanks not opened have not been systematically shown, and I have had to omit this item from the figures. Very considerable areas are often irrigated by percolation from tanks with bunds of *bhata* (murrum), and this form of irrigation is extremely valuable.

2. The tanks have been divided into tanks made by Civil Agency—(i) in the Khalsa, (ii) in the Zamindaris—and tanks made by the Public Works agency, and information has been given for each project under the following heads:—

1. Description of work and cost, i.e., tank or tar (canal),

2. Whether complete or incomplete. If incomplete, estimated cost of completion.
3. Area irrigated—
 - (a) Highest area irrigated prior to 1899-1900.
 - (b) In 1900-01.
 - (c) In 1901-02, with dates and number of irrigation.
4. Whether a new work, or repairs or enlargement.
5. If not used for irrigation brief statement of reason.
6. Local estimate of benefit derived from irrigation.
7. Brief description of soil irrigated, and if black soil, extent to which double-cropped.
3. This detailed information I have collected under the following heads by Inspector's Circles, Tahsils, and Zamindaris:—

1. Number of new tanks.
2. Cost.
3. Number not opened because not filled up.
4. Cost.
5. Number not opened for other reasons.
6. Cost.

7. Number incomplete.

8. Probable cost of completion.

[NOTE.—The estimates under this head are of little value.]

9. Number opened.

10. Cost.

11. Area irrigated.

12. Number of tanks repaired or enlarged.

13. Cost.

14. Number not opened.

15. Cost.

16. Highest area irrigated in previous years from head No. 14.

17. Number opened.

18. Cost.

18-A. Area irrigated.

19. Highest area irrigated in previous years from head No. 17.

I give in this abstract only a few remarks as to general results, but it will be apparent that should any further information be required as to any particular tract, or in any special form, it can probably be supplied either from the registers or the statements compiled therefrom.

4. In the Khalsa 334 new tanks were constructed by Civil Agency at a cost of Rs. 6,24,733 or Rs. 1,840 per tank. Of these, 86 are reported not to have filled up, presumably because the site selected was bad; and 136 were not opened for other reasons, of which the most important are that the water was kept for nistar, that the malguzar and cultivators thought that they would have to pay a water-rate for the water, that they did not know that they might open a Government tank or that the water escaped by percolation and there was no necessity to open the tank. The remaining 111 were opened and irrigated 4,280 acres—about Rs. 50 per acre or about 38½ acres each.

The number of tanks enlarged or repaired was 921, at a cost of Rs. 17,27,987 or an average per work of Rs. 18,75,448 were not opened; the highest area irrigated from these tanks before improvement was 5,486 acres; 473 were opened and irrigated an area of 24,394 acres, or about 51 acres each, cost Rs. 42 per acre. The highest area ever irrigated from these tanks prior to improvement, i.e., taking the maximum for each in any year and not the maximum for all the tanks in a given year was 14,818 acres. It may be safely taken that the maximum for these tanks in a given year was not more than 12,000 acres, and that their irrigating capacity has therefore been doubled. The tanks repaired or enlarged but not opened had an average maximum prior to improvement of 12 acres, and it may be safely inferred that they are in a suitable position to irrigate and probably to fill up, since sites selected by the cultivators themselves are mostly good; the improvements to these tanks will probably have more than doubled their capacity for irrigation, but assuming only an equal advantage, the total addition to the area commanded in the Khalsa amounts to—

	Acres.
From new tanks	4,280
From enlarged tanks	17,500

WITNESS No. 18.—MR. A. LANCASTER, Assistant Settlement Officer, Bilaspur.

1. Q. (The President.)—You are employed in the Settlement of Bilaspur?—I am the Assistant Settlement Officer for Bilaspur and Sambalpur.

2. Q. How long have you been there?—I have been in Chhattisgarh Zamindaris for 5 years, in Bilaspur for 3 years, and in Sambalpur for 1 year.

3. Q. Are you still occupied with Chhattisgarh Zamindaris?—I have finished them.

4. Where were you during the famine time?—In Bilaspur.

5. Q. Was the distress heavy there?—Yes.

6. Q. What course of action do you think it best for the Government to adopt to protect these districts from a recurrence of distress?—Protect the rice crop against drought by the construction of tanks?

7. Q. I suppose there are really a large number of tanks?—Yes; about 3,400 in the whole district.

8. Q. All small, I suppose?—Yes.

9. Q. Are there any that are likely to irrigate more than a couple of thousand acres?—About 3 or 4 only.

I should also add at least another 1,200 acres to the possibilities of new tanks from percolation and from the certainty that many of the new tanks not opened are really useful and serviceable tanks with capacity for irrigation, and I should place the addition to the area commanded at not less than 23,000 acres. The total cost of new works and improvements was Rs. 23,52,721, or rather more than Rs. 100 for every acre added to the irrigable area. There are, of course, great differences between work and work, and the results of different circles and tahsils; but in many much unnecessary work was done solely and simply to provide work or for want of intelligent supervision; and the returns in some cases suffer by reason of the enquiry being made in haste, and before all sources of irrigation had been fully utilized, and by the slackness and carelessness of the Inspectors when directed to enquire again. The few *tars* constructed, where they did not burst, irrigated areas out of all proportion to the expenditure incurred, e.g., the Patharri tar, No. 3, Circle Tilda, Simga Register, cost Rs. 2,601-11-6, irrigated 400 acres; and the Tandwa tar, No. 19, of the same register, cost Rs. 5,834-3-6, including also cost of repairs to the Tandwa Tank, irrigated over 500 acres. Jora tar, No. 96, same register, cost Rs. 1,769-13-0, irrigated 420 acres. 157 tanks are shown as incomplete, cost Rs. 3,02,438, and probable cost of completion Rs. 2,29,875. As I have already noted, very little reliance can be placed on this last estimate.

5. Irrigation was in great demand this year, more especially for the later rice, as there was little or no rain after the end of October, and the October rain was not over-plentiful. The estimated benefits from irrigation are as follows:—

	Crop obtained.	
	Without irrigation.	With irrigation.
Haruna	75	108
Majholan	68	95
Mai	58	100

Irrigation was mostly reserved for the later and more valuable mai dhan.

6. In the Zamindaris 40 new tanks were constructed at a cost of Rs. 69,075-8-0, but only 4 were opened and 131 acres irrigated. 79 tanks were enlarged at a cost of Rs. 1,31,500, but only 10 were utilized irrigating 499 acres. I am not sufficiently acquainted with the Zamindaris to criticise the figures, but the valleys between the hills retain water, and the jungle-clad hills attract rain, and there was probably much less necessity for irrigation.

7. The Public Works Department constructed 16 new tanks at a cost of Rs. 3,08,268; this, however, represents the cost of 12 tanks only; details for the other 4 have not been supplied; 2 of these only, costing Rs. 92,550, were opened and irrigated 250 acres. 13 are reported incomplete. The same department improved or enlarged 30 tanks at a cost of Rs. 2,55,460; of these, 16 were opened and 633 acres irrigated; the highest area formerly irrigated from these tanks was 209 acres from those opened and 139 acres from those not opened.

10. Q. If the Government were to make new tanks, could they easily do so without interfering with the already existing tanks or cutting down the catchment basin of the tanks already existing?—I think sufficient sites still exist for new tanks.

11. Q. Is there any particular crop more or less grown under tanks?—Rice cultivation is general throughout the whole district.

12. Q. Would it be a good policy on the part of Government to store water in suitable localities and feed existing tanks?—Yes.

13. Q. Assuming they require it and have no reserve stock of water?—Yes.

14. Q. If they did that, by what means could they get any revenue for their water?—By charging those people who take water.

15. Q. Could they do it without making a previous contract in each case?—No; I do not think they could.

16. Q. Would the Government have any right even under the exigencies of famine to say to a man, "Your

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 tank is nearly empty; we insist upon our filling it and your irrigating with it, and you shall pay one rupee or 12 annas per acre irrigated." Would that be too high-handed a procedure to be allowed?—I do not think that anybody would object to it. They would only be glad to pay one rupee an acre.

17. Q. It certainly seems to me, from what I have heard from witnesses, that while there may be room for putting in small tanks, a great deal may be done by extending the catchment areas of the existing tanks and connecting them with one great central source which could supply them in time of need?—Yes.

18. Q. What rabi crops do they grow in these districts?—Wheat, linseed, gram and different pulses.

19. Q. Are they watered at all?—No.

20. Q. Would they water them if there was water?—I believe they would, in a year of bad rainfall.

21. Q. The tanks might be filled to the brim by some store behind them, if there was any chance of the water being taken for the rabi crops?—They would use all the available water they could get for rice.

22. Q. Assuming that you had a big store behind, they would use all the water for rice?—Yes.

23. Q. They would rather give water to rice at any time than to wheat?—Yes. I think they would.

24. Q. Is any of the land double-cropped?—Yes.

25. Q. Much?—About 7 per cent.

26. Q. Is there any well irrigation in these districts?—Practically none in Bilaspur and a trifling amount only in Sambalpur.

27. Q. Is the water very deep below the surface?—Very deep; 30 to 40 feet.

28. Q. (Mr. Muir-Mackenzie.)—Everywhere?—Yes.

29. Q. (The President.)—I suppose wells are not in use, because there is so much less trouble in taking water from tanks than in taking water from wells?—Yes.

30. Q. Do you find that the tanks are kept in a fair state of repair?—Yes.

31. Q. Are many of them supplied with sluices and waste weirs?—No; they are the exceptions.

32. Q. Are the bulk of them merely percolation tanks?—When they want water they cut the bank.

33. Q. Then the whole supply runs off?—Yes.

34. Q. Practically speaking I suppose that in 9 cases out of 10 they only want water during the months of September and October?—Yes.

35. Q. That is the very height of the irrigating season?—Yes.

36. Q. Do you think they would be willing to pay a charge for water regularly, say a rupee or 12 annas an acre?—Do you mean a yearly charge?

37. Q. Yes?—I don't think they would.

38. Q. Mr. Blenkinsop has given us some interesting figures, that he has worked out with Mr. Carey, as to the value of irrigation. Mr. Blenkinsop says: "We agreed that over a series of years full irrigation would give an advantage of 50 per cent. in black soil, 100 per cent. in yellow soil, and 140 per cent. in red soil." In spite of that, the cultivators would not be willing to pay even a moderate rate?—I do not think they would.

39. Q. Do you think the cultivator could be brought round if he had water free for 2 or 3 years? Would he pay a small rate afterwards or would he not use it at all?—If he learnt the benefits of it, he would eventually pay.

40. Q. (Mr. Craddock.)—Have you got a statement, similar to the one for Raipur, as to the areas irrigated by tanks constructed in famine in Bilaspur?—Yes.

[A statement giving the information was filed.]

41. Q. Will you state briefly what was done in Bilaspur?—We constructed 619 Civil tanks and 39 Public Works tanks.

42. Q. What have they been found to irrigate?—In Bilaspur the acreage in 1899-1900 was 2,173; but this year it is 7,578.

43. Q. In the Janjgir tahsil?—The area rose from 4,469 to 11,489.

44. Q. Does that represent the full capacity of your tanks?—Yes.

45. Q. Do you think they would use them to their full capacity this year?—Yes.

46. Q. Do you think that an extension of these tanks would be of value in Bilaspur?—Yes; I think so.

47. Q. Even if there be no big projects, would you endeavour to extend these tanks?—Yes.

48. Q. Do you think people would take *takavi* to make them?—I do not think they would.

49. Q. They would want Government to make them?—Yes.

50. Q. Have you not found anything made from *takavi* in Bilaspur?—A few tanks were made in the famine of 1896-97.

51. Q. That is on famine loans given without interest and with partial remissions?—Yes.

52. Q. Have you seen no traces of ordinary *takavi* works?—No.

53. Q. What classes of people do you find are most ready to improve?—Ordinarily Kurmis and Chandanahs.

54. Q. Have you ever got Chamars to make improvements?—No.

55. Q. What part of the district would you select in the event of any big project being possible?—The north-west and the south-east corners.

56. Q. Is it in Bilaspur tahsil?—In Mungeli and Janjgir tahsils.

57. Q. Is there any project there?—Yes; there are two or three projects.

58. Q. You do not know their names?—No.

59. Q. Did Sersua suffer very much?—Yes.

60. Q. Is there any project there?—There is one called Bareli project.

61. Q. What are these projects?—Big reservoirs.

62. Q. Which would you select? Would you select these two—Sersua and Lormi?—Yes.

63. Q. Have you any relief works in Bilaspur?—Yes; in the south-west and south-east of the Janjgir tahsil, extending right into the Bilaspur tahsil.

64. Q. What tract does it adjoin?—The Lean tract.

65. Q. You would recommend something being done there first?—Yes.

66. Q. Do you think people would pay for it eventually?—I think they would.

67. Q. You had conversations with them?—Yes.

68. Q. Have you got any instances of water-rate actually paid for rice?—No.

69. Q. None at all?—None. I only heard of it.

70. Q. In Sambalpur advantages of irrigation would be still more appreciated?—Yes.

71. Q. They have not got the *lakhbata* system?—No.

72. Q. Moreover, in Sambalpur there is already a provision for making tanks and waste-weirs?—Yes.

73. Q. And it carries some remission?—Yes.

74. Q. (The President.)—Is the settlement going on in the two districts of Bilaspur and Sambalpur?—It is closed in Bilaspur and begun in Sambalpur.

75. Q. (Mr. Craddock.)—Have you ever come across any instances where tanks have been made by Gaontias?—No.

76. Q. There is a lot of old tanks in Sambalpur?—Yes.

77. Q. By whom were they made?—By tenants.

78. Q. It is the case of a village working together?—Yes.

79. Q. Is the village panchayat recognised?—Yes.

80. Q. Do you think that the prospects of pushing irrigation in Sambalpur either by *takavi* or other inducements are greater than in other parts of the division?—Much greater.

81. Q. You think people are more likely to pay there?—I think so.

82. Q. Is there the same need for irrigation in Sambalpur?—More, I think.

83. Q. Not as regards famine?—No. There is no famine need in Sambalpur as there is in Bilaspur.

84. Q. But there is a better scope for irrigation?—Yes; a much greater scope.

85. Q. (The President.)—You mean that the geographical features of the country are more favourable?—Yes. If you put a dam across the valley you can form beneath it small tanks by percolation.

86. Q. (Mr. Craddock.)—Do they ever sink wells underneath the dams?—No.

87. Q. How do they water their sugarcane?—By leading the water from the upper dam.

88. Q. Sugarcane is a very important crop?—Yes. They are making wells in sugarcane fields.

89. Q. How do you find the rates in Sambalpur as compared with Bilaspur? Is it much lower?—Yes; less than half.

90. Q. Does anybody charge for water?—No.

91. Q. Have you not heard of a case of water being charged for by Gaontias?—I have heard.

92. Q. What do you think they will pay for water?—Up to Rs. 2 per acre.

93. Q. They said so themselves?—Yes; when they need water.

94. Q. Do you think there is much field for *takavi* loans in Sambalpur?—Yes; I believe there is.

95. Q. Do you think they will be taken more readily than in Raipur and Bilaspur?—Yes; more especially

if we give them on the same terms as famine loans.

96. Q. (Mr. Muir-Mackenzie.)—May we take it that in Sambalpur the number of temporary wells has gone up from 1,997 in 1890-91 to 4,763 in 1900-01?—I believe so. We had two large estates under the Court of Wards extending to an area of 800 square miles, in every village of which the estate built *akka* wells.

97. Q. These are all put down as temporary wells?—Probably a mistake. There is not one village in a zamindari which has not a *akka* well.

98. Q. (Mr. Rajaratna Mudaliar.)—For irrigation?—For drinking purposes.

99. Q. (Mr. Craddock.)—They are quite ready to make wells for irrigation in Sambalpur?—Yes.

100. Q. (The President.)—Would they use them?—Yes; for sugarcane.

101. Q. (Mr. Higham.)—Have you any opinion to offer about the Dulara project?—In a year of drought it will protect 2,000 acres.

102. Q. Do you think it ought to be completed?—Yes; it will cost Rs. Rs. 55,000 to complete it.

Mr. A.
Lancaster.
10 Mar. 02.

FIFTY-SIXTH DAY.

Raipur, 11th March 1902.

WITNESS No. 19.—MR. GANGA RAM, Malguzar of Raipur.

In reply to Mr. Craddock.—I am malguzar of 16 villages in Raipur. Rice is our chief crop. There is irrigation in one village only, from the Telka tank which irrigates 400 acres, all in one village. It is fed from a nalla which is banked across. My grandfather built it, from motives of piety, for cattle and travellers. The irrigation is from percolation and overflow only. I take nothing from the tenants for the use of the water. I have visited the sites of some of the Public Works projects. The biggest at Beltara will irrigate five or seven villages. If Government make the tank, the rayats will willingly pay for the water. It will not assist the existing tanks owing to an intervening nalla. In a dry year a holding of 10 acres would take water for 2 acres. The tank will not deliver water to the *bhata* and *matasi* soils. We would prefer not to be charged for water by the plough. I am doubtful if the tank would lead to any increase in the cultivation of *mai* which is the later or better quality of rice, as we should have to pay the water-rate. We should prefer *haruni* or early rice and no water-rate to *mai* with water-rate. In Dhamtari tahsil *mai* cultivation increased when railway came; we have suffered from this owing to recent dry years.

To the President.—I have tanks in three or four villages, repair them with the help of my tenants which is given gratis. There is no provision in the *Wajb-ul-arz* for this arrangement, but there are no disputes.

To Mr. Muir-Mackenzie.—In 1896-97 none of my tanks breached. The crops on the Telka tank were saved in that year. In 1899 the tank failed and there was no percolation. We never cut the bunds for irrigation; not even in 1896-97, when there was water in all the tanks. Land under percolation pays more rent than dry lands. There is no sugarcane grown now in my villages; we used to grow it but stopped as the land was exhausted. I did not make any *kachcha* wells in the famine. They would have been useful but the substratum is rock and they would have involved a lot of labour.

To Mr. Rajaratna Mudaliar.—I do not levy a water in lands benefited by percolation from my tank because I get my rent. I cannot increase this and would not if I could. Even if I made a new tank I would not charge for the water; it is not the custom; tanks are made from motives of piety.

To Mr. Craddock.—We would not pay more than Re. 1-4 per acre for water even if we got a double

crop. We would rest satisfied with a single crop rather than pay extra for a double crop. I would take *takavi* and make a tank if I got the money at reduced interest and no recovery was made for two years. If offered a large loan at 5 per cent., to be recovered in 30 or 40 years, I would not take it; there is lots of scope for extending irrigation, but I would not take *takavi* on these terms. Except where there is irrigation, the people are much worse off now than they were before the dry years. Crops which would otherwise have been lost were undoubtedly saved by the new tanks made by Government and the malguzars in the famine. I don't know what the rules are regarding enhancement of revenue on lands irrigated by tanks made by a malguzar. In such cases the rent has not been enhanced nor should they be hereafter.

GANGA RAM, VILLAGE HEADMAN.

In reply to Mr. Craddock.—I am the headman of six or seven villages in Sambalpur. Rice is grown in the villages. There are tanks in two or three of the villages only. A tank covering 1 acre will irrigate 7 acres. The highest of the tanks would irrigate about 20 acres. The total area under the tanks is 80 or 90 acres. No water-rate is taken for the irrigation; it is not the custom. The tanks are cut in November or earlier if there is a long break in the rains. This year they were cut early; they only half-filled but saved half my *sir* crops. If Government make tanks no one will pay for the water. We would rather make wells, we are doing that now. Two or three rayats made wells in the famine in my villages. I have made them this year and saved 20 acres. Their number will certainly increase. Each well cost Rs. 40; we don't make them *pakka*; the water is 10 or 11 feet deep; we simply make a big hole. We began making these wells in the dry year; their use is spreading. We have stopped making tanks because when they are made Government records them in its own name and has the water distributed through a village *panchayat*; the malguzar does not like this. He wants to have the tank in his own name and the distribution in his own hands. My father and grandfather made tanks which were entered as Government; I complained but my complaint was filed.

Mr. Carey produced and explained the rules.

Witness.—If the malguzar's name is entered then we will make tanks, but not if Government gives the water to others.

Mr.
Ganga Ram.
11 Mar. 02.

WITNESS No. 20.—MR. SANTOKH SINGH, Malguzar of Raipur.

In reply to Mr. Craddock.—I am malguzar of six villages in which there are small tanks. We cut the bunds to take the water; it was not done this year except in two villages in which late rice was grown. If Government make tanks, the cultivators would take water and pay for it only when it was

required. They would pay 5 annas per acre for each watering. I have never taken anything for water not even in a dry year. In 1896-97 I gave water to irrigate land so as to save the seed supply. I took nothing for this I have not enhanced rents on account of the tanks. I have seen the proposed sites of new

Mr.
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Santokh
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Government tanks. Government should carry out the works; they will recover the cost in full when the next famine comes as there will be no relief required.

The rayat will pay for water in a dry year 8 annas per acre of land saved. Tank water is not so good as rain water.

WITNESS NO. 21.—MR. BISAL SINGH, Malguzar of Akoltara.

Mr.
Bisal
Singh.

11 Mar. 02.

In reply to Mr. Craddock.—I and my co-sharer own 56 villages; rice is grown of which some is irrigated from a tank. The tanks failed in the dry year. The tanks made in the famine did good to the lands irrigated. I had no money to make any. I prefer small tanks to big and Government will find them more economical. We will be willing to pay for water when

we recover from bad years. We will be willing to pay a fixed rate according to class of soil as we shall get double crops on some of our land. For second crops in *dorsa* and *kunhar* we will pay up 12 annas per acre in a dry year or 6 annas if the rate is fixed for every year.

WITNESS NO. 22.—MR. L. S. CAREY, I.C.S., Officiating Commissioner, Chhattisgarh Division.
Replies to printed questions.

Mr.
L. S. Carey.

11 Mar. 02.

A.—GENERAL.

1. Q. These replies refer to the Raipur and Bilaspur districts. I have been Settlement Officer in both districts and Director of Land Records and Agriculture for 5 or 6 years, also acting Commissioner of Chhattisgarh for 8 months.

3. Q. (1) The population of the Chhattisgarh Plain was up to 1896 sufficient for all agricultural purposes. Since the famine of 1896-97 some portions have become depopulated owing to death and migration.

(2 & 3) I do not consider that on the system of cultivation pursued in these parts there is any obstacle to the extension of irrigation arising from insufficiency of cattle or inadequacy of the manure supply. Rice is the staple crop and the early monsoon is usually sufficient, not to say ample. The rice crop then requires irrigation, mainly in the months of September and October, when the crop is ripening and all agricultural operations in connection therewith, except reaping, have been completed.

(4) Irrigation is doubtless less required in the black soil tracts of Dhamtari and Mungali than in the other tahsils where yellow and red soil predominate. For all that, in not a few years rice in black soil requires irrigation and is much benefited thereby. It is more difficult to find proper sites for reservoirs in black soil tracts. Moreover, black cotton soil soaks up moisture like a sponge, or it escapes through the widening cracks if the soil has had time to dry. The distribution of water in such tracts would then involve much waste. There are then undoubtedly difficulties in connection with irrigation in black soil tracts which do not exist elsewhere.

(5) We have no snow-fed rivers in these parts, but as a general rule we get a good monsoon. It very rarely happens that the rainfall fails entirely, as was the case in 1899-1900. The oldest people cannot remember another such season. Where our rainfall is at fault is mainly in the matter of seasonal distribution. Reservoirs, if constructed, would generally fill in June, July, and August, and the water would then be available in the two subsequent months to bring the rice crop to maturity. The rice crop also suffers not infrequently from long breaks in the rains after heavy falls, and this interferes with the important operation of *biast*, which takes place in July and August. Under this system the crop, after it has grown a few inches in height, is ploughed and cross-ploughed, and the surface of the field is reduced to a miry slush. During this operation the fields must be quite moist. The rice shortly revives, and for a few days does not necessarily require heavy rain, but once it is re-established good showers are quite essential, and if they are not received damage is caused. The yield of these districts would then be much increased if a sufficiency of water could be guaranteed at critical epochs in the growth of the crop.

(6) Tanks cost a good deal of money. A certain number were constructed in the past, but insecurity of title under the Mahratta rule may have checked improvements. Villages were auctioned in the past and thekadars had no certainty of continuing in possession. Many of the best tanks however, that I have come across in the provinces were made in Mahratta days. A man was promised a grant (known as a *tukm* in Chanda) if he made a tank, and these grants were duly respected. But the various *kamaishdars*, &c., were not all usually enlightened. When the country came under British rule, we could have got a large number of tanks constructed had we made the grant of proprietary right conditional on the supply of irrigational facilities. But in those days the monsoons were regular, rice ripened in abundance, prices were very low, and in the absence of railways and other means of communication to carry off the surplus, grain is commonly reported to have rotted in the

granaries. The matter was, naturally enough, lost sight of by the Government under these circumstances. Until recently there was no incentive to spend money on tank construction in this land-locked country, where the wants of the people were small, and they had little chance of converting their crops into money at favourable rates, and nothing to spend the money on if they managed to amass it. Moreover, it is only quite recently that a sense of agricultural insecurity has been forced upon the people and officials of these provinces. Up to 1896 it was the fashion to talk of these provinces as secure, and the prevailing view was that Chhattisgarh lay in the path of the two monsoons. If that from the south-west failed, the deficiency would be made good from the south-east. Shortly after the advent of British rule proprietary right was bestowed on the Gaontias, and this step might have been expected to have given a great impetus to tank construction. But as soon as these rights had been granted we set to work to restrict them in the interest of the ryots. A Bombay officer, conversant with ryotwari tenures, was deputed to the Central Provinces. It is true his mission was confined to the Chanda district, but the effect of his recommendation was felt throughout the provinces in the protection accorded to the tenants, many of whom became absolute occupancy or occupancy tenants with a rent practically fixed during the currency of the Settlement period. The rent-rate was low: the tenants were in many respects strong. The custom of the country was against any enhancement of rents, except in cases where the Gaontia or Malguzar was called upon to contribute larger amounts to the coffers of the State. That many improvements have been effected during the past 30 years admits of no doubt. A comparison of the maps prepared at my settlement with those prepared 20 years previously affords ample proof. But the actual progress of the country appears small and the amount accomplished looks diminutive when contrasted with what remains to be done. Some few well-to-do ryots constructed tanks out of piety or to secure the crop of their own lands. Many of these reservoirs were made for *nistar* purposes to supply drinking water for man or beast. But if a careful analysis were made of any given tract, I think it would be found that the resident malguzars have as a class done most for the development of their villages. Where a proprietor saw a chance of directly increasing the yield of his own land, he was probably not slow in building a tank or making a *tar* (channel) from a *nalla*. But it often happens that not even the malguzars have any decent-sized compact block of land in any part of the village. This is due to what I should be disposed to term the pernicious habit of *lakhahata* under which periodic re-distributions of land used to take place, involving the actual subdivision of existing fields if any new ryots were admitted to the village community. On the occasion of such new admissions each of the old ryots gave up some of his cultivated land in favour of the new comers, and took from the malguzar a portion of waste to be newly subjugated. Further, when a holding is split up among the co-sharers the custom is to subdivide each separate field so that each participant may receive a fair share. The value of rice land depends much more upon position than soil, and in an undulating country such as Chhattisgarh fields vary greatly in their capacity of holding up water. The result of the customs above described which it is

believed are in a measure peculiar* to the Bilaspur and Raipur districts is that any given cultivator's holding is spread over the surface of a village, each so-called field consisting of a few decimals of an acre. The

poorer the soil the smaller do the fields run, and in some villages they are little bigger than handkerchiefs.

* In Sambalpur to the east and in Bhandara and Balaghat to the west fields as distinct from mere subdivisions to hold up water are much larger. A group of 20 to 30 such subdivisions belonging to one man are not uncommon in those districts.

The *lakhbata* system is now dying out, but in spite of the efforts of several Deputy Commissioners little has hitherto been accomplished by exchanges and otherwise in the way of consolidating holdings.

I believe that this system of parcelling up the land has retarded improvement. Individuals cannot improve scattered holdings consisting of infinitesimal portions, and it would not repay a man to build a tank when he would only derive 5 per cent. or less of the total benefit accruing from the expenditure of capital. This is the reason why in Chhattisgarh one finds fewer ryots who have constructed tanks for the benefit of their own holdings than in the Wainganga districts. Again, I am disposed to think that *malguzars* have been in a measure deterred from constructing tanks for the benefit of the general community owing to the difficulty of recouping their expenditure. Tenants, as previously stated, do not usually manifest any readiness to pay an enhancement or a water-rate. They might in the past have agreed to pay something in seasons when they were threatened with a failure of their crops, but for the additional security afforded by the existence of a tank, few would in the eighties have consented to pay an enhanced rent year by year, whereby the constructor of a tank would have got a fair rate of interest on his outlay. In this respect, however, there has been a revulsion of feeling caused by a succession of losses, and there are, I fancy, few ryots now-a-days who would not agree to pay a reasonable water-rate as an insurance against crop failures.

Under Section 31 of the Tenancy Act the ryot is entitled to improve his holding. The landlord may step in after due notice if the ryot refuses to improve the land on the lines desired and make the improvement himself. Under Section 13 a *malguzar* can then apply to a Revenue Officer for the enhancement of the tenant's rent on the ground that an improvement has been effected, whereby the productive power of the holding has been increased. This all looks very well on paper, but it will be years before the Chhattisgarh is conversant with this procedure, and it would not in the past have conducted to village peace if a landlord had forced improvements down the throats of his ryots and secured enhancements by an appeal to the Revenue Officer. A Chamar peasantry would probably have burnt the house and ricks of so progressive a landlord. In a country where witchcraft is still practised, and the people are unenlightened, these methods would not be approved. But the two recent famines have had an educative effect, and many persons who prior to 1896 scowled if one suggested an improvement which would submerge a few infertile rice fields, now clamour for Government to complete and enlarge the local tanks constructed in the famine, and to undertake a number of new projects which will add to the irrigable area of their villages. I was on special duty in Raipur in 1896 as Director of Agriculture and worked out a scheme of local works which were ultimately constructed by the *malguzars* from their own resources or from famine loans free of interest. I did not receive much encouragement then and much pressure had to be brought to bear. I have since visited many of these tracts and find many of my opponents converted into staunch supporters. It is not too much to say that many tracts in Chhattisgarh have this year been saved from a third famine owing to irrigation facilities afforded by the tanks which were constructed in 1896-97 on the system above detailed and in 1899-1900 by the direct agency of Government with funds supplied by the State. And at the present moment wherever crops have been short the villagers are instant in their request that Government should start tank works in their villages.

(7) I do not think the fear of enhanced rent or revenue assessment has operated to restrict the extension of irrigation. In the 20 years between Mr. Hewitt's settlement and that effected in 1888-91, I question whether such an idea ever presented itself to the people. Now-a-days it may be somewhat different with short term settlements recurring somewhat frequently, and I am on the whole disposed to think that it would be good policy for the State to forego an increase of assessment on the ground of land being rendered irrigable by private enterprise. Government would be well repaid in respect to the increased security of its revenue, in the enhanced prosperity of the country-side and in the reduction of expenditure on famine relief.

(9) I consider we require some legislation in respect to easements. Many *tars* or canals could be made from *nallas* or over waste land direct to the fields or to feed existing tanks, but the proprietors of intervening villages often decline to allow a water-way to be constructed through their lands.

Further, I have come across existing tanks which might be used for irrigation, but which the owners refuse to cut in spite of the desire of the community to use the water for irrigation purposes. The owners represent, but not always with justice, that the water is required for the cattle or other purposes.

Yet again the repair of old tanks which impoverished owners are unable to keep in proper order requires consideration. A silted up tank is useless. It cumbers the ground. Power should, I think, be taken for the State, the *malguzar*, interested agriculturists, or the village community to repair such tanks after due notice to the proprietor.

4. Q. I have answered this above. The existing provisions are by no means illiberal, but I think we stand to gain much more than we should lose by abandoning the idea of assessing on irrigable facilities which manifest themselves for the first time on the construction of a tank or other source of irrigation. The lesson of the past few years is clearly that we should give every possible and reasonable encouragement to increasing the irrigable area in Chhattisgarh. If the above proposal be deemed of too radical a character, then I think it would be preferable to fix a definite term of years for the period of exemption. If a man makes an improvement directly after the revision of settlement and this continues for 20 years followed by another 20 years' settlement he will enjoy 39 years' exemption. If, however, he delays until a settlement is drawing to a close and the ensuing settlement is only for a short period years, which may be quite insufficient. Moreover our (say 10 years), the period of exemption is only 11 present system conceivably encourages people to postpone the carrying out of useful improvements, so as to get the maximum concession attainable. In view of the above considerations, I advocate the fixation of a definite term of years corresponding if deemed necessary to the magnitude of the outlay.

5. Q. Loans under the Land Improvement Act are not freely taken by the people. In answering Question 3 I have explained to the best of my ability the backwardness of the people in making improvements. Recovery of Government loans has been reported elastic in the past. This is doubtless the case, and it would be bad policy not to insist on punctuality of repayment when seasons are normal. But I do not think the people can complain of our procedure latterly. They have been treated considerably and instalments of land improvement and famine loans have not been pressed for in the face of bad crops.

Now that the people appreciate the benefits of irrigation, I believe the practice of taking loans for land improvement would extend if we were blessed with a few good seasons. The rate of interest is very moderate and by no means burdensome. Under Rule 14, page 225 of the Revenue Manual, 35 years can be granted for repayment of the loan. This is an ample period, longer than usually necessary. People who taken loans are anxious to pay them off as soon as possible from the proceeds of their crops. No extension of the period is required. I have no suggestions to offer under this head for popularizing the system of land improvement loans. If the State is ready to waive its claim to the additional assessment of land that has been improved by private enterprise, I should think this concession would be much appreciated, and I doubt if any further bait is called for.

6. Q. I see no reason to suppose that the extension of irrigation will injure the remaining cultivation. If cultivators were attracted from unirrigated to irrigated tracts, the proprietors of the former would be forced in self-defence to construct tanks which would be a great boon to their villages. I should gladly welcome any such automatic pressure upon them.

The second part of this question I have answered above in dealing with Question 3. I have endeavoured to show what a change has come over the feelings and attitude of the people in respect to irrigation during the last five or six years.

23. Q. (1) The tanks are supplied with water mainly from the rainfall. But *tars* or canals are sometimes constructed from *nallas*, and frequently the catchment area is extended by the construction of *tars* across the bare *bhata* (moonam) wastes whereby water is diverted into the tanks.

(2) The banks of tanks or their ante-chambers (*paithas*)—are usually cut within water is to be distributed. The *malguzar* often singly, but sometimes assisted by a *Panchayat* of cultivators, sees to the distribution, and he naturally does not neglect his own fields. The water distributes itself generally by gravitation, and is taken from field to field by cutting the field banks. But when the water level in the tank is below the lands to be irrigated, resort is had to the

Mr.
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Mr. "chapa" system, two men swinging a basket and L. S. Carey. thereby lifting water to a higher level.

11 Mar. 02. (3) The supply of water is maintained often throughout the year in a season of ample rainfall. In such years the tank bunds are not cut and the crops ripen without irrigation.

(3) (b) In a year of scanty rainfall, the amount of the latter determines mainly how long the tank will hold out, but the character of the previous portion of the season is also an important factor. Sometimes the whole of the water is used for *biyasi*, and heavy showers subsequently received refill the tank. At others the crop fails after *biyasi* for want of water.

It often happens that the early monsoon is heavy and continuous and the tanks are not cut until September or October when the crops are coming to maturity and moisture is deficient. In 1896-97 a number of tanks were breached by exceedingly heavy rain at the close of August, and this circumstance added greatly to the crop failure when the monsoon suddenly withdrew.

(3) (c) In a year of drought the tanks may never fill properly or may be exhausted at sowing time in June or at *biyasi* which takes place during July and the first part of August. There is then no water to give to the ripening crops and they wither away in common with the crops on unirrigated lands.

(4) Tanks are generally small. We have not very many large sheets of water. Some small ponds irrigate only 5 to 10 acres. An ordinary Chhattisgarh tank would water 25 to 30 or 40 acres. The land is undulating and the area commanded by many tanks is small. Some of our new tanks made in the famine have irrigated as much as 80 to 120 acres this year. But I do not think there are many such.

24. (1) Q. Irrigation often enables a crop of pulse, i.e., urad, mung, tiura (lakh) or linseed, to be raised in black soil fields which but for the existence of a tank would be too dry to sow. The system in Chhattisgarh is known as 'utera'. Water is let out of the ripening rice fields and the seed is broad-casted in the miry slush. This generally takes place at the end of September or early in October. In Bilaspur I have also seen rice fields which retain sufficient moisture after the rice is cut, ploughed up and gram sown. Very occasionally wheat is sown as a second crop in very fertile soils, but in Chhattisgarh this practice of ploughing up and taking a second crop is very uncommon.

(2) In irrigated lands the better descriptions of rice are sown which give a heavier yield and also command a better price in the market. Such varieties take a longer period to come to maturity. In parts of Chhattisgarh sugarcane is still grown for local consumption though the area has declined in latter years. The failure of recent monsoon may have operated to reduce the area, but the competition of beet-sugar is also responsible; and the opening out of the country by rail and roads has enabled the people to get their supplies of *gur* and sugar from Bombay or the North-Western Provinces. I do not think the increase of irrigation facilities is likely to lead to an expansion of sugarcane cultivation, which seems only to pay now-a-days when pursued on a large scale on co-operative principles.

(3) (a) In a year of ample rainfall seasonably distributed irrigation would not increase the produce. The tanks would not be used.

(3) (b & c) It is all a matter of degree and depends upon the amount of the rainfall as well as on its seasonal distribution. The present year 1901-1902 is one of scanty rainfall. There was good rain in most parts in July and August, but a deficiency in September and October. I have this year seen a bare 2-anna crop on one side of a road in unirrigated land and a 14-anna crop irrigated from a famine tank on the other side. The difference in the value may be taken roughly at Rs. 12 or Rs. 15 per acre.

25. Q. It is difficult to say. But I would repeat that in Chhattisgarh the early monsoon is generally adequate and tanks are invaluable in September and October when the rainfall is short in bringing rice to maturity. They likewise in many years enable the various operations connected with rice culture to be performed at the proper periods. This is a very important matter. Of course if the monsoon were long belated and the tanks were empty, no amount of subsequent rain would make up the loss. Again, if all the tank water were exhausted at *biyasi* and owing to the withdrawal of the monsoon the tank did not fill properly afterwards, the crop might conceivably be a total failure. I have come across several villages this year where the people husbanded their water-supply too long from fear of being left without drink-

ing water for man and beast. The result in one village, viz., Palunda, is a crop of 5 annas against 14 annas—a loss of Rs. 10 to Rs. 12 per acre.

26. Q. I have never known tank irrigation supplemented by wells in Chhattisgarh.

27. Q. The normal average yield in Chhattisgarh is taken at 900 lbs. of dhan to the acre, and this estimate is generally deemed too low. This is an all-round average for black, yellow and red soils irrigated and unirrigated in all the various position. An irrigated crop in a well placed and adequately manured field would yield 2,000 lbs., while on the higher lying unirrigated mooram (*bhata*) slopes, a cultivator would not complain if he got 600 or 700 lbs. Given irrigation, I should be disposed to raise the all-round factor from 900 to 1,400 or 1,500 lbs., on the average of a normal term of years. It is true that in years of heavy rainfall the unirrigated land would yield 1,200 lbs., and over. But the average is brought down by unfavourable seasons that occur in every decade. Given irrigation, cultivators would grow more *mai*, late ripening, and heavy yielding varieties in preference to *haruna*, early ripening. The difference then over a series of years, would be 600 lbs. of dhan approximately, i.e., the value of the yield of rice per acre would be raised from Rs. 15 to Rs. 25, or by Rs. 10 per acre.

(2) In a year of drought the difference might, and probably would, be that between a fair crop and a total failure, say, 20 per acre, and if allowance be made for the doubling of prices in famine years, the difference could fairly be stated at Rs. 40 per acre. In 1896-97 when the crops failed dismally in Raipur and Bilaspur, the Sambalpur district, which was reached by the south-east monsoon, simply coined money out of the adversity of neighbouring districts.

28. Q. At the time of settlement we assess irrigable lands higher than dry areas. In Chhattisgarh about Re. 1 to Re. 1-8 might be charged for irrigated land against annas 10 to Re. 1 per acre unirrigated. I have explained in answering previous questions that Chhattisgarh tenants very rarely agree to pay a water-rate, and malguzars have not hitherto resorted to the improvement sections of the Tenancy Act.

On our malguzari system under which the State takes 50 to 55 per cent. of assets, land assessed as irrigated would pay about annas 4 more an acre than unirrigated land, provided of course the improvement was not exempted from assessment for the term of settlement. We have during the last 10 or 15 years assessed on the area ascertained to be irrigable in the course of settlement enquiries. To aid us we have had in some cases the record of a number of previous years. Anyhow the water channels have to be examined and indications of the existence of irrigation studied, so that the fields benefiting from irrigation may be properly selected.

29. Q. No private expenditure of money is necessary to bring the water to the fields. The cultivator or his permanent labourers do what is necessary in the way of cutting fields, banks, &c. It is an ordinary incident of the year's cultivation where tanks exist.

30 & 33. Q. The maintenance of tanks has often been neglected in the past, but this is less common now-a-days. The owner of the tank generally repairs. He is usually jealous as to any interference, thinking his rights will thereby be jeopardized. If the owner is impoverished the tank may go to ruin; please see my reply to 3 (9).

The silt is often valued for manurial purposes and the ryots remove it as they please. I do not think there is any systematic removal of silt nor, according to my observation, do tanks silt up very quickly in red and yellow soil tracts. The tendency is doubtless greater in black soil tracts where tanks are less numerous.

31. Q. I have answered this under 3 (9) and 23.

32. Q. I think we should do all in our power to encourage construction of tanks by private persons. Please see reply to Question 5. If exemption in perpetuity from additional assessment on account of such improvement does not prove a sufficient inducement, then in the last resort we might try reduction of the rate of interest, or remission of the interest, partial remission of the advance or grants-in-aid. But my own belief is that agriculturists are now fully alive to the need of tanks, and are not likely to be lulled in a sense of security for some time to come. Exemption from additional assessment on land irrigated from newly-constructed tanks will furnish a very strong incentive.

CONCLUSION.

I may add in conclusion that I am strongly in favour, where this is possible, of diverting running streams along *tars* (canals) and thereby filling both existing reservoirs and others to be newly constructed.

I believe we shall do more good in this way and get a larger supply of water for irrigating the rice crop,

than if we construct a number of large reservoirs and rely entirely on the rainfall to fill them.

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1. Q. (The President.)—You have had long experience of this part of the country?—Yes.

2. Q. You say that "the population of the Chhattisgarh plain was, up to 1896, sufficient for all agricultural purposes. Since the famine of 1896-97, some portions have been depopulated owing to death and migration." Do you know what loss of population there was in this district?—Excluding Feudatory States the population in 1901 as compared with that of 1891 showed a decrease of 9 per cent. in Raipur, 13 per cent. in Bilaspur, and an increase of 4 per cent. in Sambalpur.

3. Q. You say, Mr. Carey, in reply to paragraphs 2 and 3 of Question 3, "I do not consider that on the system of cultivation pursued in these parts there is any obstacle to the extension of irrigation arising from insufficiency of cattle or inadequacy of the manure supply." The insufficiency of cattle depends upon the food supply of the cattle generally?—Yes. There are plenty of cattle, but a lot of them are wretched beasts, which are now cumbering the soil and eating up the grass that would be available for the better ones. The grazing is very bad and rice straw is very in nutritious. In this reply I am contemplating irrigation from tanks not from wells. It is no use contemplating the latter until the bullocks are better nurtured.

4. Q. In reply to paragraph 6 of Question 3, you describe the scheme of local works which was started by you in 1896 as Director of Agriculture. Can you tell us exactly what it was?—It was a scheme for granting advances to malguzars to make tanks. Twenty or 25 per cent. of the amount was given to them as a grant-in-aid and no interest was charged. It was thought fair to allow for the inefficiency of famine labour. If a man took Rs. 500 he paid back only Rs. 400.

5. Q. How many years did you give him for repayment?—It depended upon the size of the loan. The recovery was generally spread over 7 or 8 years and in some cases over 10 years. But we could under the rules go up to 35 years.

6. Q. (Mr. Muir-Mackenzie.)—These advances were made under the Land Improvement Act?—Yes.

7. Q. (The President.)—These loans did not receive much encouragement?—No. The people took them only under pressure.

8. Q. How much money was given out in the shape of loans?—Taking the land improvement loans and the famine loans the figures are:—

District.	Land Improvement Loans.	Famine Loans.	Total.
	Rs.	Rs.	Rs.
Raipur . .	1,38,858	2,55,843	3,91,701
Bilaspur . .	66,477	1,12,027	1,78,504

9. Q. Upon what was this money spent?—Largely on improving old tanks and making new tanks. Perhaps a few *tars* were made, but I do not think that much was done in that way.

10. Q. The money was not given for the purchase of seed?—It was not intended for that. Takavi under the Agriculturists' Loans Act was given separately afterwards. I know there were a few cases in which it was mis-spent and was subsequently recovered.

11. Q. (Mr. Muir-Mackenzie.)—You do not think that the misappropriation was very extensive?—No. I do not think so, but I was not a famine officer then.

12. Q. In reply to paragraph 7 of Question 3 you say, "I am on the whole disposed to think that it would be good policy for the State to forego an increase of assessment on the ground of land being rendered irrigable by private enterprise." Would you advocate the system of exemption for ever and perpetually?—This is a very difficult question; I must say that personally I am in favour of it, if it could be done. I see one great difficulty that lies in the way. If you let off an increase in perpetuity, I do not see how you can assess in future on general considerations without laying yourself open to an accusation of bad faith. If the countryside improves and people

get prosperous you can increase the assessment, but the people will say that the increase is due to their improvements.

13. Q. (Mr. Muir-Mackenzie.)—They can hardly say that the dry land is improved by their tanks?—No; but the tenant will be in a much better position to pay the enhancement of rent if he has land that is half irrigated and half unirrigated; his standard of comfort will have risen; now-a-days very large deductions from standard rates have to be made on personal considerations of individual poverty, etc. But under altered conditions we could assess more boldly up to our deduced valuations. If the countryside improves and people avail themselves of the facilities afforded for irrigation, it seems to me that they might cast that reproach upon us.

14. Q. Do you think that would be a logical ground for imputing breach of faith? Are people logical?—I do not think that this is generally the case when their pockets are touched.

15. Q. (Mr. Rajaratna Mudaliar.)—In the Madras Presidency such lands are treated as dry and are liable to enhancement in the same way as other lands not affected by private works are liable?—That is what I meant. The Settlement Officer would be told not to assess benefit from improvements.

16. Q. If there are two pieces of land, one of which is improved by the construction of a tank or a well and the other not, and if the same two pieces were originally assessed at the same rate, the enhancement on the one containing the well will be the same as the enhancement on the other. In such a case will there be breach of faith?—No.

17. Q. (The President.)—We have heard a proposal put forward by Mr. Sly that there should be no enhancement for 30 or 40 years, and that the man who had made a tank or a well should be considered a muafidar for a certain portion of his land; and he considers that the sentiment attached to making a man a muafidar would be an inducement to people to take loans and make improvements. Do you agree in that view?—I cannot say that I feel very enthusiastic about it. I would prefer the non-assessment of improvements.

18. Q. In reply to paragraph 9 of Question 3 you say, "I have come across existing tanks which might be used for irrigation, but which the owners refuse to cut in spite of the desire of the community to use the water for irrigation purposes." In time of real drought, when water is wanted, don't you think that the District Officer would be justified in insisting upon a man's tank being cut and the water utilized?—He has no power to do so now.

19. Q. Why not given him the power to do so?—It would require a long enquiry to find out if the water was really going to waste. For instance, he will have to find out if the water is more than enough for the cattle. If he cut the tank and found afterwards that the village cattle have been dying for want of water, his position would be awkward. The people act generally in their own interests.

20. Q. I thought it was recognized here that they did not act in their own interest. If not, why should they prefer to drink tank water to well water and keep their tank water instead of using it for irrigation?—There were very few irrigation works a few years ago in Chhattisgarh. The tanks that were built formerly were made for domestic purposes generally. Tank water is said to be softer and thus much more suitable for cooking rice, the staple food in these parts.

21. Q. Do you think that it would be desirable that there should be a legal authority empowering a Revenue Officer, in case of emergency, to take possession of the water of a district and distribute it in the interests of the people?—It would be a very good thing if we could have more power in that respect.

22. Q. I think one of the witnesses somewhere said that malguzars, although they did not attend to repairs themselves, did not like an outsider interfering. Don't you think that in the event of an emergency arising it is desirable that the District Officer should have the power to insist upon a tank being repaired by the malguzar, or to have it repaired himself?—Yes. It is very desirable. In Chanda I believe this provision is entered in the *Wajib-ul-arz*.

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23. Q. (Mr. Muir-Mackenzie.)—You said that a number of tanks breached in 1896-97?—They were breached by the very heavy flood we had.

24. Q. Have they been repaired?—Yes; for the most part.

25. Q. By the malguzars voluntarily?—Yes; or by the village communities.

26. Q. (The President.)—Are there a great many villages in this district which have no drinking wells?—Yes; wells are exceptional. The people will not drink water from wells. Government has made a number of wells and they are beginning to drink a little well water now, but they won't let Chamars go to a well which is resorted to by the Hindus, though they can go to the same tank. They say that the well water does not mix well with rice. They will not drink well water if they have a tank.

27. Q. In the event of the Government going in for an extension of irrigation on a large scale, would you advocate storing up water and conveying it to the existing tanks, or do you think we ought to keep clear of these tanks?—I am strongly in favour of bunding up nallas and making *tars* and of the Government legislating for easements for making *tars* through waste lands and across villages so as to fill existing tanks. It seems to me that a lot of water of streams goes to waste in September and October. I am told by the officers of the Public Works Department, that they are in hopes of evolving a scheme to prevent this water going to waste. If by banking streams they could make big reservoirs, it would be a good thing; but a great deal could be done without reservoirs and fairly cheaply by diverting and utilizing the water which now runs to waste in September and October. The construction of a reservoir, I look upon as an expensive business. I think water could be obtained more cheaply at the outset, and I would like to see all the cheaper *tar* schemes pushed through first. I would take up initially those nallas like the Sogra, Kolhan and Jamania, which flow as a rule for nine months out of the year. The Sogra *nallah* had quite a good stream in October last when the rice was withering, and was still flowing in March of 1902, a very dry year.

28. Q. But the *nalla* might run dry, and if there is any chance of that you must have storage to keep the *nalla* going.—Yes; that is so. The storage would render us still more secure. I would spend money on this class of work after constructing the *tars*. The *tars* could be fed from the reservoir.

29. Q. Do you think it would be possible to arrange with owners of private tanks that they should buy water from us?—I anticipate no difficulty. They are not quite so unenlightened as they want us to believe. One or two sample schemes would soon reveal the position. I would advocate the giving of water free for a year or two just to see what can be done, and I think their self-interest will do the rest.

Mr. Higham.—In regard to the proposal to exempt from liability to an increase of assessment on account of irrigation advantages, due to the improvements made by the malguzar, I do not quite understand whether you propose to give a perpetual exemption from all enhancement of assessment on account of such advantages, or an exemption for a definite but limited number of years from enhancement on any account whatever?—I am personally in favour, if it can be arranged, of permanently exempting from additional assessment lands which are rendered irrigable by private expenditure.

30. Q. For all time?—Yes.

31. Q. From additional assessment of all kind?—No, but from additional enhancement on the ground of irrigability; but I foresee difficulties as stated just now.

32. Q. It has been represented to us that people would not be satisfied with the assurance that their assessment would never be enhanced on account of their improvement so long as they were liable to enhancement on other grounds and that it would be more effective if you could give them an absolute assurance that they would be exempted from enhancement of any kind for a definite period, say 20 or 30 years. That is what you appear to contemplate in answer to Question No. 4?—I suggested that as an alternative if my original proposal was deemed too radical.

33. Q. (Mr. Muir-Mackenzie.)—You only meant to exempt improvements temporarily, if perpetual exemption was thought too liberal?—Yes. I have stated definitely what my own wish is—that is to see improvement permanently exempted. That will pay in the long run, in the increased prosperity of the country

and in many other ways. Moreover, if my scheme be adopted for Chhattisgarh, under which Government would construct *tars* and reservoirs and charge by meter for filling existing tanks and others to be constructed, the question of exemption will not arise at all. Provided water can be supplied in the manner suggested, I should expect to see the people construct and repair, without further inducement, their own tanks and ponds to hold the water that the Public Works Department may be able to divert or impound in the manner above stated.

34. Q. (Mr. Higham.)—Would it not be a more effective alternative to exempt land irrigated in consequence of the improvement from enhancement on any ground, whether on account of the improvement or on general considerations, not in *perpetuo* but for a limited period?—That would be an inducement, but I do not think it would be quite so good as the other which I have suggested. But I do not know that inducements of this kind are really of very much importance. My own view is that if people want to make improvements they will make them irrespective of the assessment, which is a mere flea-bite in these parts. But no doubt your proposal to exempt from enhancement on any ground for a term of years would remove the objections that have been raised to my proposal.

35. Q. (Mr. Muir-Mackenzie.)—My doubt is whether it would not still be felt to be breach of faith in those cases in which the assessment on the whole holding was enhanced, although the enhancement might have been foregone on that part of the holding which has been irrigated in consequence of improvement?—Yes; in such a case the feeling of breach of faith might still prevail.

36. Q. (Mr. Higham.)—Have you anything on record to show the number of private tanks improved by *takavi* loans in 1896 or in 1899?—I will make a note of it and let you know.

37. Q. I understand that a considerable area was protected during the last year by works carried out during the last famine?—A very large area.

38. Q. Can that area be definitely stated?—We can give you the area under Government tanks.

39. Q. And not under private tanks?—Not now. We shall have to compile a statement.

40. Q. You have data to proceed upon?—Yes. We have the area irrigated every year. We can get the area irrigated at present and the area irrigated prior to the improvement.

41. Q. You have records to show that?—Yes.

42. Q. Do you consider that there is a large scope for further improvements in these private tanks, supposing you give a sufficient inducement to malguzars?—Yes. I think there are a lot of tanks still incomplete.

43. Q. Suppose we were to offer them exemption from enhancement and liberal terms in the way of *takavi*, do you think that much could be done by private individuals in making new tanks or improving the existing ones?—There is a very great deal to be done, but I do not think proprietors are at all willing to take money at present. They have been hard hit by the famines; they have got the loans of 1896-97 still to pay, which will continue for some years more.

44. Q. Would they require assistance in the way of examination of tanks by experts or do they know themselves what they want?—Not much in the case of private tanks. In most such cases they know what is wanted. I do not think they require very much expert assistance.

45. Q. What possibility is there of improving the condition of private tanks through the malguzars, apart from anything that the Government may do?—There is enormous scope for it, but they cannot do anything just yet.

46. Q. Not even if offers of exemption from enhancement of assessment are made to them?—I am not very hopeful.

47. Q. If we arrange to fill the existing tanks from large reservoirs made by Government we shall have to charge different rates for irrigation under existing tanks and for the new irrigation under the works that we make?—I suggest that the Public Works Department charge by meter on the amount of water supplied to fill the tanks. The head man could, I believe, easily distribute the charge among the *ryots* on the basis of seed-capacity irrigated. Otherwise distribution could be based on the *patwaris'* record of areas irrigated. I would wish to have one or two sample projects to gain experience and give water free for a year or two, so that the people might learn the ad-

vantages that would be derived from taking the water. We shall then be in a position to know how far the water can go and how far the engineering projects really render secure the area reached by the water. People are nervous about assessment until they know that their supply is assured.

48. Q. On any land that is actually irrigated would you allow them to have the water absolutely free or would you charge them a small sum for each crop?—I think it would be worth our while to be liberal at the outset.

49. Q. The advantage of levying a small rate is that you keep a record of the area irrigated? Could you not keep a record even if you gave it for nothing?—I am in favour of giving the water absolutely free for a year or two. Then we shall be in a position to know where the water goes and how much area we can render secure, and also we shall learn what improvements are made in the methods of cultivation, whether the ryots will substitute a better class of rice, extend their double-cropping, etc.

50. Q. (Mr. Muir-Mackenzie.)—The distribution will have to be regulated?—Yes. The moment they quarrelled about distribution I should put on a rate.

51. Q. (Mr. Higham.)—Whatever rate you charge, it will be very small; I am not thinking of the loss of revenue to Government by giving the water free, but there are advantages in charging a small rate; people very often do not value the things that they do not pay for; at the same time it will show you how much water has been taken.—Could you not keep a record without levying a rate?

52. Q. If it is an advantage to give it absolutely free, I do not think that one need consider the cost; but I should be inclined myself to think that a small rate would rather be an advantage than otherwise?—I think that even a small rate might choke off a number of people from trying to use water and seeing what the advantages are. If it is given free more people would take it and pay for it when they see the advantage of it.

Mr. Higham:—That is question on which I should like to have Mr. Craddock's opinion.

Mr. Craddock:—It is very hard to give a definite opinion. As the thing is in an experimental stage it is better to try as many devices as possible. Why not try one tank with a four-anna rate and another with the grant of water free. Say one in Bilaspur and another in Raipur?

Mr. Higham:—We might say, let anybody who wants the water take it for the three or next five years or whatever the time may be, and then distribute the shares permanently in each village taking this water, according to the use which they made of it. Those villages that made the most use of water and appreciated its advantages and paid a water-rate for it would be entitled to get a larger share than others. Everybody would come in for fear of being left out in the cold?—Do I understand you to suggest the auctioning of water?

53. Q. Certainly not. That was suggested by a witness, but I don't think auctioning would do. I would simply say that for the next five years anybody can have water for his crop if he pays a very small water-rate on the actual area irrigated, and at the end of five years you would see the use to which the water had been put and how much each village had taken. Then you would permanently distribute the supply in accordance with the demand that had existed during these five years?—You mean that pioneers of the movement will have a priority of claim for water?

54. Q. Yes. Have you any objection to that?—I have no objection to that.

55. Q. The villagers would be anxious to apply for water so as not to be left out in the cold when eventually the permanent distribution is made of the tank supply on the basis of the annual charge on the area commanded. Those villages that have applied for it and have shown appreciation of its use while you were working on an occupier's rate will have preference?—That would be like securing original shares in the Army and Navy Co-operative Society, for instance.

56. Q. You would try the system of levying a small fee in one place and the system of giving it free in another?—Yes.

57. Q. If they do not pay anything for water they may not care what they do with it?—You mean they would let it go to waste?

58. Q. Yes. Do you think it necessary to bind ourselves to give it to them for a certain period, say three years?—I don't think we need bind ourselves to do that. If we find that they are wasting water we can

stop the supply. It might perhaps be a good thing to give it one year without charge and see if there is any abuse. There is no particular reason why we should bind ourselves to give it for three years for nothing.

59. Q. We are all agreed that we need not look too much for revenue?—To bring the water into the field requires some effort. They have to cut the bunds and put the men on to the fields. They would not do that if they thought that the water was not going to benefit their fields.

60. Q. You would try giving the water for nothing the first year and then put a rate on afterwards?—Yes. I was rather in favour of giving it free for two or three years.

61. Q. Whatever we do, we must begin with charging on the area irrigated and not on the area protected?—Yes. In any case it would have an educative effect on the officers of Government and the people themselves.

62. Q. (Mr. Muir-Mackenzie.)—Such tanks as there were in 1896 filled very well, did they not, in that year?—Yes, many to repletion. I would not say all, but the greater number did fill. There was a very heavy fall of rain at the end of August and that carried away many of the banks.

63. Q. Can you tell me, or put me on the track of getting the information, whether the villages where these tanks existed sent an appreciably less number of people to relief works than those villages which had not such tanks?—I do not think it is possible to give you that information. There are no rolls kept of people who were employed on relief. Perhaps village-to-village enquiry might elicit it.

64. Q. Such an enquiry could only be made in a few villages?—Yes. A lot of people are dead. I don't think you will get any reliable information.

65. Q. The reason I ask this question is that in Bombay, for instance, several people have said spontaneously to the Commission that villages which were under certain works of irrigation sent nobody to relief, while a large number from adjacent tracts went to relief. I want to find out whether there is anything similar to that in this province?—It seems to me that proposition does not require any proof.

66. Q. Apparently it does, for some people have told us the contrary?—I have my notes of my tour this year, and all I can say by personal observation is that the tanks have been of use in saving people this year. In one instance I have in mind the villagers got a 14-anna crop on one side of a road which was watered, and practically nil on the other side which the tank water did not reach.

Mr. Blenkinsop:—Very few people, in villages where the crops were saved, went to the relief works in 1897 and 1900.

67. Q. The point is that even where only a small area of a whole village was irrigated none of the people went on relief?—I have noticed the same thing myself; the *lakhbhata* system is useful in that respect.

68. Q. We are not able to make any comparison; we are not able to say that so much percentage of the population would have gone to relief if they had not had tanks?—We cannot say that from personal observation. But I am prepared to say that the tanks are saving the people this year.

69. Q. There is a large part of the Division in which there are no tanks?—There are tanks of sorts in most places.

70. Q. In every village?—In most villages.

71. Q. The rainfall is so capricious that some do not fill at all. You will pardon me for saying that you seem to be making a very considerable generalization. To pass to another point, have you observed that in zamindari areas irrigation is very much less than in malguzari areas?—Yes. Irrigation in zamindaris is much less developed, there is much more wild country, and there is much more forest and more rainfall than in malguzari areas.

72. Q. Is that simply on account of the backward condition of the country; has it nothing to do with tenure?—Yes. The *lakhbhata* system does not seem to have spread over there, which would be in favour of tank construction, but the country is wild and capital is scarce.

73. Q. The *lakhbhata* system is an obstruction to irrigation?—It is one of the greatest obstacles to irrigation.

74. Q. In spite of that fact, irrigation is less in the zamindari area?—It is less, because there is more

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jungle and more rainfall. Population is sparse and there are few well-to-do people. The zamindars also in the past ejected their *thekadars* at will.

75. Q. You say in reply to paragraphs 2 and 3 of Question 3, "The rice crop requires irrigation, mainly in the months of September and October." Does that occur in most years?—If you ask me for the decade 1882—1892 I should say "no," but I should say "yes" if it is for the last nine or ten years. During the last nine or ten years the monsoons withdrew early, and I should say "yes" since 1891-1892.

76. Q. If the monsoons had been more regular they would not have required irrigation in September and October?—They would not have required it is often. They would require it at some period of the growth when there is a break.

77. Q. Whenever there is a break in the rains water would be used?—I would not say it would be used, but it would be useful.

78. Q. In Raipur a good deal of the deep black soil resembles ordinary black cotton soil?—Yes, especially in two parts of the district, viz., Dhamtari tahsil in the south and a good deal of the north-western tract.

79. Q. Is rice grown in any of that soil?—Rice is grown entirely in Dhamtari; there is no wheat.

80. Q. That is on a soil very similar to black cotton soil?—It is black cotton soil.

81. Q. Is there any part of the Division where cotton used to be grown formerly and where it has now been replaced by rice?—I do not think that cotton would ever be replaced by rice.

82. Q. I have heard it was done in Kawardha Feudatory State?—There was more cotton there before the railway came.

83. Q. Has it since been replaced by rice?—No, by millets and pulse, viz., kodon and tur. Cotton must have an undulating country; it would not grow in flat water-logged land suitable for rice.

84. Q. With regard to the advantage likely to arise from taking tank water it occurred to me on going about the country this morning that cultivation is rather slack. Is there not a very great fear that the people will not be inclined to grow the finer varieties of rice and to try for a second crop?—In the year 1896-97 when I came to Raipur on special duty I enquired why the crops had gone to ruin. In the light of my previous experience as Settlement Officer I expected to find the earlier crops off the ground. But the advent of the Bengal-Nagpur Railway and the stimulus given to trade had led the ryot to give up largely the cultivation of lighter and earlier ripening varieties. I found much of the higher lying lands under *gurmattia*, a late ripening variety which gives a relatively heavy yield.

85. Q. You hope that if a similar stimulus be given by irrigation they might be induced to grow better varieties?—Yes, certainly; among the Hindu portion of the population at least. We have a number of Kurmis.

86. Q. Are all the private tanks registered as the property of the malguzars?—No, they are the property of the tenants when they make them.

87. Q. Are there many such?—There are very few in Chhattisgarh owing to the *lakhbhatta* system. There are many more in Bhandara and Balaghat.

88. Q. Are they registered as the property of the tenants?—If they are made on his own land they are registered as the property of the tenant.

89. Q. What sort of control have malguzars over a malguzari tank? Has his leave to be obtained for the bund being cut?—Yes, he would have to be consulted.

90. Q. Would he be able to refuse even to the considerable injury of his tenants?—Yes; and keep all the water for his own land.

91. Q. And he does do it?—Yes. I am afraid that some of them are selfish.

92. Q. You think you would require more power to enable the tenants to get water when it is really required by them?—Is not that rather interfering with a man's private right? If a man digs a tank for the benefit of his own cultivation I do not see how we could interfere with his rights. I am not ordinarily very much in favour of interfering with a man's private rights. We can enforce the *Wajib-ul-arz* under Section 123 of the Land Revenue Act.

93. Q. (The President.)—Do you not think that in time of emergency the Revenue Officer should have certain control over water for public good?—I think it would be a good thing in that case.

94. Q. (Mr. Muir-Mackenzie.)—It was suggested by Mr. Craddock that it would be advisable for Government to have the right of acquiring tanks so as to have control over the malguzars. Do you think it would be a good thing that Government should have the power to acquire tanks under the Land Acquisition Act?—It might be as well to have the power.

95. Q. I asked Mr. Blenkinsop yesterday why the *lakhbhatta* system should deter malguzars from making new tanks or improving their old tanks and I understood him to say that the only reason was that the malguzar could not get a block of his own land under the tank?—I think that is a very strong reason.

96. Q. What other strong reason is there to deter them?—The difficulty of getting the tenants to pay more.

97. Q. Can he not get an enhancement at the settlement?—The Government takes half and the other half that goes to him is very little.

98. Q. Under the existing rule, if he makes a new tank or makes a substantial improvement to an existing tank, the Government would not get anything; the malguzar would get all?—Yes; but not till the next settlement.

99. Q. The malguzar could apply for enhancement?—Yes; but that would give him a lot of trouble. If a malguzar had a compact block of 100 acres or so in a suitable position he would in many cases build a tank.

100. Q. Had you much to do with the distribution of *takavi*?—Nothing worth mentioning.

101. Q. Have you any opinions to offer about any improvements in the system,—for instance, about having a special establishment to distribute *takavi* for the encouragement of irrigation?—No.

102. Q. You don't think it is necessary? You don't anticipate any demand?—No.

103. Q. You think that the officers, in spite of the other things that they have to do, have time to do this?—I think it will take several years before people will come forward for loans under the Land Improvement Act. It will take them some time to pay off their old loans.

104. Q. Do you think it is quite hopeless to effect an increase in the number of wells?—I don't think we ought to set to work on wells. We can get better value for our money by extending *tar* and tank irrigation. A well will command so small an area and water has to be lifted therefrom. I have heard from the Sambalpur witness to-day that some ryots have dug wells in their fields. I have not come across any such wells. Until we improve the breed of cattle we cannot get the bullock power necessary to raise water. If the experiment that we are making of introducing *juar* cultivation succeeds and the breed of cattle improves, then I think the country has a great future before it. Until we improve the cattle nothing can be done. It does not pay to lift water at present. In the Nagpur Division they have a very superior breed of cattle and they have cotton seed and *juar* stalks to feed them on.

105. Q. Do you think that wells would have held out better than tanks if we had had them in 1899-1900?—I do not think we should have had the bullock-power to lift the water.

106. Q. That may be; do you think the wells would have held out?—I am afraid I cannot say. I do not know much about wells in Chhattisgarh. Even if they held out, we had not got the bullock-power, but it is true ryots might have worked the *tenra*.

107. Q. You don't think that *tenras* (*pycottahs*) which elsewhere are largely used on wells dug in the irrigable area under tanks, and are found exceedingly useful in saving crops when the tank supply fails, can be used with advantage? Don't you think it would be a good thing to encourage such supplementary wells?—Irrigation from *tars* gives much less trouble and is very much cheaper. The Chhattisgarh people are for the most part lazy and won't lift water all day long from a well while they can take water from a tank. Moreover, cultivation is very rough and the value of the produce per acre very low. Well irrigation only pays when the crop yields Rs. 30 or 40 an acre. Again, you might get water easily if you dug right under a tank bund, but these wells would probably command only such areas as were kept damp by the percolation of water from the tank. If you dug your well away from the tank you might have to go deep to get water.

108. Q. There is the question of saving crops?—It is not the custom to use wells at present.

109. Q. I merely want to know what possibility there is of introducing that system. Not much, you think?—Not much, at any rate in my Division.

110. Q. Suppose you were given Rs. 5,000, would you not be inclined to try and make a few wells and get men to use them to grow *juar*?—I don't think I would spend the money so. I would not refuse the Rs. 5,000, but I would spend it better. I would go in for *tars* and bund up *nallas*.

111. Q. Do you not think it possible that a good many cattle and a lot of crops could have been saved if considerable sums of money had been spent on digging *kacha* wells?—I don't think they could be dug easily in many parts of the Division, as we have a rocky sub-soil here.

112. Q. I am told that some *kacha* wells have been dug for the purpose?—That might have been the case in a few places, but I do not think it was common. I believe the sub-soil here is very largely rocky.

113. Q. I am told that if a great many *kacha* wells had been dug a great many more cattle would have been saved?—We did not, to my knowledge, lose many cattle during the last famine. I do not believe in wells in Chhattisgarh.

114. Q. All these tanks go dry in a famine year like 1899-1900?—Yes. They are not very much good in such a season.

115. Q. Is it not worth while making a trial as to wells—an experiment based upon the experience of other provinces? You would not call it nonsense?—No. I should advocate it very strongly in Nimar, Betul and Chhindwara. But I should not advocate it here; we can spend money better.

116. Q. In a year of famine?—The idea was present to the mind of everybody during the famine of 1896-97, and it would have been done if it could have been done. The action taken by Sir Antony Macdonnell's Administration in the North-Western Provinces, in respect to the digging of *kacha* wells, was published in the *Pioneer*. I believe some papers on the subject were also circulated by the Central Provinces Administration. But in the North-Western Provinces you have alluvial soil. Here the case is different. *Kacha* wells are not so easily made. The whole object was to get water, and if wells were possible they would have been dug.

117. Q. Did you try a single well?—No; I am not a believer in wells. It may be my fault, but I am not as yet converted to wells in Chhattisgarh.

118. Q. (Mr. Rajaratna Mudaliar.)—You said that if you had money to disburse you would prefer to spend it on increasing the number of *tars*?—Yes.

119. Q. Is there much scope for increasing their number in this division?—I believe there is; there is

ings and on the lands benefited by improvements?—It would involve an enormous amount of calculation. Each field has to be dealt with separately. In one village I know there are 13,000 khasra numbers and it would be an enormous task to fix a separate assessment on each individual field.

128. Q. We do it in ryotwari areas in Madras?—I know that, but your fields are different; they are much bigger. It has been done in a few of the ryotwari villages that we have, but it involves a tremendous amount of work.

129. Q. In cases where private improvements are effected could not these lands be separately shown with the assessment of rent thereon? In cases where the lands are improved you might group these fields in the same manner as is done with rice lands?—I think it might be done, but I do not think that the tenant would appreciate it in the least; he would look to his lump assessment. There is no good in telling him the component items of the lump assessment.

130. Q. If these items were separately shown he would know what the increases on the different items were?—You will be paying a lot for sentiment, and it will cost the Government a good deal to do that. You have to compare the present rate on the unimproved portion with the proposed rate on the same and then contrast it with the rent of the improved property. You cannot break up the present rent for each holding. Nobody knows how much a ryot pays for each individual field comprising a holding.

131. Q. Even the Settlement Officer does not know it?—Nobody knows it. If a man takes up 130 plots, he pays 10 or 15 rupees for that parcel of land.

132. Q. How does the Settlement Officer arrive at the lump sum?—He records what the *malguzar* and tenants tell him is the lump rent of the holding. In revising the rent he calculates the area of each class of land and values at the rates sanctioned for the village.

133. Q. Is that system prevalent throughout the province?—In the Raipur country you have the assessment on the holding. A separate assessment on the field is found occasionally in the Nagpur country. Generally speaking, in the province the rents are very low and were based originally on the plough.

134. Q. Where this system does not prevail, even there the rent is assessed at a lump sum?—Generally speaking, we assess in the lump throughout the province. The assessment on the plough was the old basis.

135. Q. In the memorandum sent by Mr. Blenkinsop he said that there were several new tanks constructed and several repaired and enlarged. He roughly estimates that the area irrigated was practi-

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142. Q. What about the Asnidh tank?—I am told it is a good project. Last year I was told it was not favourably regarded, but this year I have heard otherwise. My opinion as to Hardi and Dulara being good projects is based on Mr. Lancaster's report.

143. Q. (Mr. Higham.)—What about the Tilal tank?—I have not got a note about that.

144. Q. (Mr. Craddock.)—In Raipur, what would you suggest?—I am prepared to accept what Mr. Blenkinsop suggested; the completion of the Marowda and Khapri-Aranda projects, on which money has been spent in the famine.

145. Q. There is no project that touches the Loan pargana?—None that I know of.

146. Q. I suppose you would not press for anything in Sambalpur?—There is a very good project in Sambalpur, viz., the Lakhanpur; but if there are only 3 lakhs to be spent, I would sooner spend it in Bilaspur and Raipur.

147. Q. What would you do in Sambalpur for irrigation?—Sambalpur is far ahead of Raipur and Bilaspur in the matter of irrigation. People there have done much more than the people of these districts.

148. Q. A Sambalpur witness that we heard to-day explained that they are greatly deterred from spending money on tanks because of the rules regarding them in the *Wajib-ul-arz*?—These rules may have deterred them, but yet they have done more than the people of Raipur have done. I don't believe that they have been deterred, but I do not pretend to possess such a knowledge of Sambalpur as I have of other districts.

149. Q. Have you given much in the way of land improvement loans in Sambalpur?—There is very little demand for them. I think most people in Sambalpur have got money to effect the improvements themselves. They are well-to-do. They were not hit in the famine of 1896-97: they coined money out of that.

WITNESS No. 23.—MR. C. W. E. MONTGOMERIE, I.C.S., Deputy Commissioner, Bilaspur, and late Settlement Officer, Nimar.

Replies to printed questions.

[The questions are referred to only by their numbers, and are not repeated in the reply.]

A.—GENERAL.

1. Q. The Nimar district of the Central Provinces which I re-settled in 1895-98.

2. Q. The average rainfall before the recent year of famine was, in the years 1868 to 1895:—

Tahsil.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	Total.
Khandwa.	0.34	6.02	9.44	6.68	7.03	1.28	0.20	0.44	0.38	0.24	0.12	0.14	32.40
Burhanpur.	0.26	4.61	8.97	7.57	6.70	1.87	0.30	0.44	0.49	0.16	0.09	0.06	32.50

The rainfall is the lightest in the Central Provinces, and the tract consequently occupies a special position as regards agriculture. The rainfall is very well suited to *juar* and cotton, and too light for rice or *rabi*.

3. Q. (1) No. But there is not yet sufficient population to force an irrigation.

(2) No.

(3) As usual, the supply is deficient, and the areas sown with cotton and *juar* compete for the manure with the irrigated area.

(4) Not in the bulk of the district; but the black soil of the Tapti Valley (Burhanpur tahsil) and the black soil adjoining the Nerbudda at the north-west of the district (Kanapur-Beria pargana) would probably stand only well irrigation and not general canal irrigation.

(5) The only drawback is that in a year of light rainfall the wells and streams tend to run dry.

(6) No.

(7) I think not. The last three assessments have all lowered the "water-rate."

(8) No. All tenants have occupancy right.

(9) The trap rock in places does not yield water to wells at a reasonable depth.

4. Q. I think the existing exemption is sufficient, provided that the conversion of a *kacha* well into a *pakka* well and substantial expenditure on deepening wells are, in each case, treated as separate improvements.

5. Q. Loans were taken (when I was in the district) fairly freely for well-sinking. There was undoubtedly fear of not being able to pay, by accident, strictly in time, and of the disgrace of being dunned by Government; but this feeling is good, and should be met simply by extending the attractiveness of the loans by means of prompt and easy distribution.

I do not think any of the six concessions mentioned in the question necessary. The remission of the advance in the case of failure to obtain water, however, I would recommend if sufficient safeguards against fraud could be devised, e.g., that the loan should be actually repaid, but held in deposit for three years, and then dealt with by the Deputy Commissioner's order.

6. Q. No.

The dry year 1895 considerably stimulated well-sinking.

General.—Irrigation serves only 2 per cent. of the cultivated area and is capable of considerable extension, but I deprecate any attempt to substitute irrigated *rabi* for the excellent system of *kharif* cultivation now in use. The extension of irrigation is wanted—

(a) to get a greater variety of crop and a greater outturn from villages already fully occupied;

(b) to form a reserve of water, to be used in saving the *kharif* crops in times of drought.

C.—CANALS.

12. Q. (1) In the Nimar district a moderately flat plain extends from the neighbourhood of Khanwa to the northern branch of the Satpuras, and in this plain streams are dammed with a temporary dam, commonly made every year when the first burst of the rains is over, from palm trunks, brushwood, stones and mud, and the water is led off by a side channel. The area watered is not great, and only a section of the village combines; but the addition of channel irrigation to well irrigation has the effect of raising the average area irrigated in a village, over the whole of the tract, to 30 acres, against about 10 acres to a village in the rest of the district. But there is more well irrigation than usual in this tract.

The system is not capable of much extension.

(2) An earthen channel annually repaired by joint labour takes the water, and the cultivators, being a small body, arrange among themselves their turns for the water. The lead is sometimes over a quarter of a mile long.

(3) (a) Until the *rabi* is harvested.

(b) Not long enough for properly watering the *rabi*. The water is sometimes thrown from the dam into the channel by wooden scoops hung from a bar.

(c) I have not seen a year of drought.

D.—TANKS.

23. Q. There is no system of tanks in the Nimar district, but it is necessary to mention the Lachhora reservoir at the north-west of the district, because it might be taken as a precedent for constructing other tanks.

This reservoir is virtually the only irrigation tank. It was originally constructed by the Ghoris of Mandu, fell into disrepair, and was repaired at the famine of 1845. It pays interest on the cost of repairs only. Though it is a proof that tanks can be made and used for irrigation, the almost unqualified failure of the small tanks made in the famine of 1845 vetoes the construction of irrigation tanks on the plains of Nimar. It is possible that tanks might be constructed by the State on the flanks of the northern line of the Satpuras which separates the Khandwa Tahsil from the Burhanpur tahsil, but they would be foreign to the habits of the people and probably expensive. The extension of irrigation can be better done by more wells than by more tanks.

E.—WELLS.

34. Q. As regards wells, the Nimar district falls into two divisions—

(A) The area of trap which forms the bulk of the district.

(B) The alluvial tracts which adjoin the Nerbudda at the north-west of the district, and the Tapti in the Burhanpur tahsil.

(1) Average depth to water in cold weather—

(A) 20 feet.

(B) 45 feet.

(2) From percolation. They never become saline.

(a) No.

(b) Yes.

(3) Kachha well—Rs. 60.

Further cost of lining and so making pakka—Rs. 300.

(4) Kachha well, from 8 to 50 years according to the hardness of the material in which it is sunk. The mouth of a kachha well gradually crumbles; and after a varying number of years it must be lined with brick or stone, or else the mouth goes on widening until it is no longer safe to build out a projecting run to overhang the mouth of the well; the well must then be abandoned, as it would be too costly to line it and build its mouth up to ground-level again.

Once lined the pakka well is, with repairs, practically permanent.

(5) The water is raised by a leather mot, holding, on the average, 34 gallons or $5\frac{1}{2}$ cubic feet of water. At the well mouth the water is discharged into a small masonry cistern, from which it passes out through a small hole in an even flow into the irrigation channel. A pair of good bullocks, a driver and a woman or boy to regulate the flow are required.

(6) A well is usually constructed at some favourable part of an ordinary holding of 15 or 20 acres. It commands, as far as I can recollect, about four acres.

(7) The area commanded is irrigated annually.

35. Q. (1) Two crops are the usual object of digging a well, viz., an early rice or other kharif crop followed by rabi.

(2) Special crops, such as chillies, are grown, in parts of irrigated plots by ordinary cultivators, and on the whole of the plots by gardening castes.

(3) I take wheat as an example. The estimate of the outturn of irrigated wheat is cautious.

(a) Irrigated: 1,250 lbs. per acre (if it escapes rust).

Unirrigated wheat: 770 lbs.

(b) Irrigated wheat: 1,000 lbs.

Unirrigated wheat: 385 lbs.

(c) Irrigated wheat: 750 lbs.

Unirrigated wheat: 120 lbs.

36. Q. (1) Irrigated:—

	Rs. a. p.
600 lbs. rice at 11·70 seers to the rupee	25 10 0
1,000 lbs. wheat at 16 seers to the rupee	31 4 0
Total	56 14 0

Unirrigated:—

320 lbs. uncleaned cotton at 8·25 seers to the rupee	19 6 0
Gain	37 8 0

By-products, straw and cotton seed, are not counted as they are used by the cultivator. The greater bulk

of the rice and wheat straw counterbalances the greater value of the cotton seed.

I have taken an example on good land (*thavar shari*), because such land is, as a matter of fact, frequently irrigated.

On poorer land the proportionate advantage in favour of irrigation is greater.

(1) Irrigated:—

	Rs. a. p.
400 lbs. rice at 11·70 seers	17 2 0
750 lbs. wheat at 16 seers	23 7 0
Total	40 9 0

Unirrigated:—

160 lbs. uncleaned cotton at 8·25 seers	9 11 0
Gain	30 14 0

But the valuation is here at normal rates. At scarcity rates the gain would be greater, since the price of cotton does not rise during scarcity, like the price of food-grains.

37. Q. (1) As all rents are fixed by the State, the average annual rate for water is that fixed, in addition to the "dry" rate, at re-settlement. It varies with the class of soil. The average per acre may be taken as—in the Burhanpur Tehsil, Rs. 1-13-0; in the Khandwa Tahsil, Re. 1-0-0. This is then the average paid by a tenant.

() The malguzar pays to Government as revenue Re. 0-14-6 of the Re. 1-13-0, or Re. 0-8-0 of the Re. 1-0-0 which he receives from the tenant.

A plot-proprietor (*malik-makbuza*) pays 83 per cent. of the Re. 1-13-0 or Re. 1-0-0 to Government.

These rates are paid on the area usually irrigated by the well, and are fixed for the term of settlement.

38. Q. (1) Failures occur, but men who have an "eye for the lie of the land" are consulted.

(2) Difficulty is frequently found in getting through hard rock. I have never heard of Government assistance being given for irrigation wells, but think there is real scope for it. The wells are now commonly sunk by men who wander about sinking wells where they are to be constructed. These men should be temporarily employed by the Public Works Department [to make up for their loss of time and wages] and trained in improved methods of well-sinking, particularly the use of dynamite. They would then be able to get through the hard rock which now baffles them.

If these men are unwilling to be trained, the State could create a demand for better work (which the professional well-sinkers would have to meet) by placing expert well-sinkers at the disposal of agriculturists who wished to sink wells; the charge for this service should be as low as the rates charged by ordinary well-sinkers, and might be remitted where water was not reached. At the close of the experts' term of work, the recusants would probably be glad to accept the offer of training.

The cultivators in Nimar are intelligent and would probably not distrust the Government well-sinkers.

39. Q. No, because—

- The people are, to a reasonable extent, prepared to make wells for themselves.
- Government wells would clash with the malguzari system of land revenue collection.
- The burden of repairing such wells should not be laid upon the State, which has already enough to do.

40. Q. No.

5. Q. (Mr. Muir-Mackenzie.)—What is the principal dry crop in Nimar?—Juar and cotton; these two are grown alternately.

6. Q. (The President.)—You say that the wheat crop is irrigated?—Except in black cotton soil tracts it is usually irrigated.

7. Q. By what means?—By wells. Besides that, the lowlying fields at the bottom of valleys are double cropped with rice and wheat.

(Mr. Higham.)—These lowlands are not irrigated?—No.

8. Q. (The President.)—Is there a fine breed of cattle?—Quite good. Small but good.

9. Q. Was Nimar hard hit in the famines?—Not in the famine of 1897; I was not there in the famine

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1. Q. (The President.)—Nimar is the district that you know best?—Chhindwara and Nimar are the two districts that I settled; my written answers refer to Nimar.

2. Q. Is not Nimar rather unlike most of the other districts in the Central Provinces? For one thing well irrigation seems to be possible there. There is a good deal of wheat cultivation?—Wheat cultivation is almost confined to irrigated wheat except in parts which have an alluvial soil, quite a small part of the district.

3. Q. I understand that there is not so much black cotton soil as in Hoshangabad?—No, not nearly so much.

4. Q. You say that it has the lightest rainfall in the Central Provinces?—Yes.

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of 1900, but I know it was badly hit as regards the actual failure of crops. It had been very lucky in having gone on for half a century without a famine.

10. Q. Judging from the figures you give you had rainfall in the south-west monsoon?—Yes.

11. Q. You had a little rain in October?—Yes.

12. Q. Nimar is not blessed with tanks?—No.

13. Q. In reply to Question 5 you say "Loans were taken (when I was in the district) fairly freely for well-sinking. There was undoubtedly fear of not being able to pay, by accident, strictly in time, and of the disgrace of being dunned by Government." Is that felt as a disgrace?—Yes, they are a self-respecting set of people.

14. Q. Do you know whether large *takavi* advances were given out?—Nothing very great. In 1896-97 the amount was above the average, but I think it was not very great.

15. Q. Do you know what was given out since?—I am afraid not.

16. Q. Is it a place where you think it is possible to have a large extension of well irrigation?—No, not very great. It will come with the increase of population more than anything else.

17. Q. Assuming that there is an increase of population, do you think that the physical features of the country are such as to make extension of well irrigation possible?—Now it is only 2 per cent. It can go up to 10 per cent. easily. After that it may be difficult to find sites for wells.

18. Q. Is there much difficulty now about finding sites. Do they make mistakes in selecting sites?—They make some mistakes, but I don't think mistakes are very common.

19. Q. Would you approve of the Government giving assistance in the way of expert borers to give advice in the matter of sinking wells?—Yes, very strongly. I have suggested that the men who now actually go about sinking wells should, if possible, be trained.

20. Q. You say in reply to Question 6: "Irrigation serves only 2 per cent. of the cultivated area and is capable of considerable extension, but I deprecate any attempt to substitute irrigated rabi for the excellent system of kharif cultivation now in use." That is *juar* I suppose?—*Juar* and cotton. It pays them very well.

21. Q. Is the country practically covered with kharif?—Yes.

22. Q. So that there could not be much extension of rabi cultivation without a diminution in kharif cultivation?—Yes.

23. Q. You say that, "The extension of irrigation is wanted (a) to get a greater variety of crop and a greater outturn from villages already fully occupied; (b) to form a reserve of water, to be used in saving the kharif crops in times of drought." What is the line that you would advocate to ensure Nimar against the recurrence of famine?—I do not think it can be secured.

24. Q. I understand that it is not a district in which we could put tanks?—Tanks might be possible along the edge of the Satpuras. But that would be a big business.

25. Q. Do you think that there is a limitation as to the protective value of wells?—Yes, decidedly. If they do serve as a protection it would be in this way: that they would have enough water to give one watering for *juar* and cotton just at the critical time when the crop is beginning to fail from want of water at the end of the rains. But that is the time when the well may also be called on to moisten the rabi land for sowing in addition to the two or three waterings ordinarily required for the rabi crop. There is also the other drawback that very often the wells are too low to command the high-lying cotton and *juar* lands.

26. Q. How deep is the spring level below the surface of the ground?—I should say 20 feet.

27. Q. With reference to wells, would people take *takavi* advances readily or is any inducement required? It is obviously an advantage to Government that there should be extension of well irrigation as far as reasonable?—The people are ready, but not anxious, to take *takavi*.

28. Q. They would take much more if the Tahsildar or the Revenue Officer had more time to devote to this subject and make enquiries into applications for loans?—I don't think that would make much difference. If one Extra Assistant Commissioner at headquarters were always accessible to receive applica-

tions, it should be quite enough. To facilitate applications, one particular court-room should be known as that in which applications would be received.

29. Q. Are complaints made as to the rate of interest demanded?—No.

30. Q. Or the length of time in which they have to re-pay them?—I have not heard of any complaints.

31. Q. (Mr. Higham.)—Is tank irrigation not suited to the Nimar district?—Not as a whole. There were little tanks made in the famine of 1845. They failed with great regularity. They all dried up.

32. Q. I see by the rainfall statistics that the minimum rainfall is much less than the average rainfall in proportion to the other districts?—Yes. I have known quite a good *juar* and cotton crop on a 21-inch rainfall well distributed.

33. Q. (Mr. Higham.)—Mr. Harriott in his note on Nimar says, "The great difference between the average and minimum monsoon rainfall (the latter being only a little more than a fourth of the former) will make tank projects in this district expensive, as their storage will have to be excessive as compared with the yields from their catchments, to enable them to last through droughts." That is the general condition in this district?—I should think so.

34. Q. That is the reason why almost the whole irrigation in the district is carried on by wells?—Yes; also that tanks do not hold water.

35. Q. You mean the tank leaks?—Yes.

36. Q. That is due to the soil?—That is due, I believe, to cracks in the trap rock underneath.

37. Q. Are there many tanks in the district?—Very few.

38. Q. They have been no good at all?—No good whatever. They were made in the famine of 1845.

39. Q. (Mr. Muir-Mackenzie.)—Were they put in efficient order?—They were roughly done. There was no expert advice, but they were quite finished.

40. Q. (Mr. Higham.)—I see that the Lachora tank is a failure; is that due to leakage?—It is silting up, probably.

41. Q. There is a very large proportion of *kachcha* wells?—Yes.

42. Q. Were they made during the late famine?—Many of them are of old standing; *kachcha* wells stand for a number of years in trap rock.

43. Q. Would it be a good thing to convert them into *pakka* wells?—It is expensive, but it is necessary in time. It costs about five times the original cost to really make a *kachcha* well into a *pakka* one.

44. Q. Do you think it would be a good thing to encourage people to make them *pakka* by giving them specially favourable terms?—Yes.

45. Q. Do you think they would respond?—I think it would be suitably done by giving them special exemption from assessment for making a well *pakka* and by treating the two things as separate, i.e., treating the digging of a *kachcha* well as one improvement and the conversion of the same well into a *pakka* well as a second improvement.

46. Q. You give them exemption from assessment if they make a well?—Yes, for the remainder of the current settlement and for the term of the next settlement.

47. Q. (Mr. Muir-Mackenzie.)—Exemption from enhancement?—Exemption from water-rate.

48. Q. (Mr. Higham.)—What concession would you give for making a *pakka* well?—I would give another exemption for another settlement.

49. Q. If a man makes a *kachcha* well you would give him exemption from assessment on the improvement for the remainder of the settlement and also for the following settlement?—Yes.

50. Q. Having made a well, if he makes it *pakka* you would give him exemption for a second settlement?—Yes.

51. Q. What is the term of settlement?—Twenty years.

52. Q. Would it not be better to give him exemption for a definite number of years?—That would be inconvenient to the executive. We naturally reassess the irrigated area at the time of re-settlement and it will be inconvenient if we have to re-assess a plot of land in the middle of a settlement.

53. Q. You might give him a *sanad* which stated the amount due as water-rate and exempted him from paying the water-rate for so many years?—That is possible.

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54. Q. Would there be any particular inconvenience in it?—There will perhaps be a small loss of money to Government. The malguzar might get the water-rate for the rest of the term of settlement without paying any part of it as revenue.

55. Q. If you are anywhere near a settlement, it will hardly pay the cultivator to make an improvement. The value of the improvement at present depends upon the time when the next settlement is to take place?—Yes.

56. Q. If a man improved a well and made it *pakka*, you propose that he should be exempted from any enhancement of assessment for something like 40 or 60 years?—Yes.

57. Q. Suppose you made it 50 years straight off without regard to the time of settlement?—I can only say that it would be inconvenient on the administrative side. It would not be easy to work it although it may be better for the rayat.

58. Q. I see that a few tank projects have been prepared for the Nimar district and have been so far prepared as to reach stage No. II. Do you know anything about them?—I have not seen or heard about the projects.

59. Q. There are apparently three projects which are prepared?—I do not know any of the sites except Lachora.

60. Q. Is Lachora capable of improvement?—There is a practical difficulty there. We could only irrigate a certain area of land, because all round is Holkar's territory.

61. Q. If wells were made in this district, would they be steadily worked and worked in all seasons or would they require them only in years of drought?—I think they will work them steadily. Very few of them will be kept merely as a reserve.

62. Q. (Mr. Muir-Mackenzie.)—What is the kind of soil on which wells are usually made?—Usually in fairly good soil; black and brown, but medium as a rule; generally with a porous substratum; very seldom really deep black soil.

63. Q. In reply to paragraph 4 of Question 3 you say that certain soils will probably stand only well irrigation and not canal irrigation; if they would stand the first, why don't they stand the second?—I am afraid that it is rather a guess, but I think that canal irrigation in rich soil tends to form swamps.

64. Q. You say in the next clause, "The only drawback is that in a year of light rainfall the wells and streams tend to run dry." Have you observed at all whether the wells outlasted the streams?—They did, but not very much. In 1896-97 the rainfall was very light, and both streams and wells fell short.

65. Q. Did irrigation fall off very much in consequence?—A good deal. I am afraid I cannot say how much exactly.

66. Q. Did people not deepen their wells to try and get more water?—Yes, but not to any great extent.

67. Q. As an encouragement to well irrigation you seem to think that the exemption which they receive is fairly effectual?—Yes.

68. Q. It is not the case in Nimar as it is in other provinces that they do not understand the effect of it?—I explained it to them a good deal, and I think I made some of them understand it; but Government action in this respect does not affect them much.

69. Q. If a man has the assessment on his whole holding enhanced, does he not care about the remission of water-rate?—I do not think they care very much. If they wanted to make a well they would make it and not bother themselves about the assessment.

70. Q. Because the assessment is already so light?—In one tahsil it is very light.

71. Q. What is the assessment on well-irrigated lands?—In the part where most of the wells are, it is about one rupee an acre.

72. Q. That probably is not very deterrent?—No.

73. Q. (Mr. Craddock.)—That is the extra assessment?—Yes.

74. Q. (Mr. Muir-Mackenzie.)—That comes to Rs. 2 in all?—Yes.

75. Q. When the assessment is so low the question of exemption does not matter much?—No; but they naturally like the exemption.

76. Q. Have you had much experience of the actual distribution of *takavi*?—None.

77. Q. Did people complain to you about the long delay that occurs in the disposal of their applications?

—It is very much better done now than it used to be before.

78. Q. I find that the amount distributed even in famine years did not come up to Rs. 15,000 a year. If you were Deputy Commissioner of the Nimar district how much do you think you could get rid of if you were determined to push well-irrigation?—Not more than Rs. 3,000.

79. Q. In some districts in Bombay we distributed 1½ lakhs year after year and that, long before the famine was thought of?—The difficulty is that you have to break down previous financial arrangements.

80. Q. You mean the *bania*?—Yes. The cultivator will either do the work out of his savings or go to the money-lender. You would have to worry them a good deal to get them to take much *takavi*.

81. Q. If you concentrated all your attention on this subject you could bring it up to half a lakh?—No. You would have to make a man change his cultivating arrangements from unirrigated kharif alone to a mixed system of unirrigated kharif and irrigated rabi; he would have to think out how it would suit him, and he would not be hustled into it.

82. Q. How long would it take for you to double the number of wells?—Would it take 20 years?—Yes, with steady attention.

83. Q. Not within ten years?—I would prefer to put it at 20.

84. Q. I could show you districts in the Bombay Presidency which are very much behind what they are in Madras in the number of wells and in which a single tahsil has 5,000 wells. You have only 3,000 in Nimar, and I am in hopes that you might be able to increase them. Is it the existing practice for a tenant to get the consent of the malguzar before taking a loan?—No.

85. Q. Is there very much trouble in discovering whether the security is sufficient or not?—No. In Nimar they are all occupancy tenants.

86. Q. Still even in rayotwari tracts we have very great trouble about securities in the way of prior mortgages and such other things. When you have a small amount of advance to make, it would be of no use to have a special establishment?—No.

87. Q. You say that you recommend a remission of the advance in case of a failure to obtain water. You think that a partial remission would do?—Yes, quite.

88. Q. In reply to Question 12 you say that in the plains in the neighbourhood of Khandwa, streams are dammed with a temporary dam. Is there any chance of that being extended much?—It is difficult to extend it, because the people must do it themselves, and there are lots of rights of way and other things to be arranged.

89. Q. Would you charge them extra rate at the next settlement?—Yes.

90. Q. Would you think it worth while to forego this or do they think it so low that it would not make much difference?—I think it might be almost worth while to forego it as a *stimulante*.

91. Q. In Chhindwara the amount of *takavi* advances is even smaller than in Nimar. Is there any scope for extension?—The difficulty is this: Chhindwara has two distinct parts—in the southern part cotton and juar are grown and there are just the same difficulties in extending irrigation as you find in other cotton-juar tracts. In the northern part where there is a good deal of opium and sugarcane irrigation, opium is prohibited and sugarcane is on the decrease.

92. Q. Why?—The methods are too expensive and the plantations too far away from the railway. Further, the growers are not up to date with their methods.

93. Q. They are beaten therefore by imported articles?—Yes.

94. Q. (Mr. Rajaratna Mudaliar.)—You said in reply to Mr. Higham that it would be inconvenient for administrative purposes if you made the period of exemption for improvements a fixed term of years?—Yes.

95. Q. What is the difficulty? You have simply to show the full amount of the rent and exhibit the difference between that and the rents fixed at the former settlement as the amount of exemption?—The difficulty is simply this: We revise all our rents at the settlement and any revision between two settlements would be inconvenient.

96. Q. But the procedure, I suggested, involves no revision at all?—It is practically a revision, because we have to send a notice to the man saying that

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from such and such a day forward he will have to pay so much and that we will proceed to collect so much.

97. Q. I do not see any difficulty in it. The full rent is already noted in the register and you charge him that when the exemption period expires?—As a matter of fact, the malguzar would get it for the remainder of the settlement. We should not bother ourselves about it. We should make a present of it to him.

98. Q. What is the insuperable difficulty?—The difficulty is not insuperable, it is only inconvenient to do it.

99. Q. You said that if temporary wells were made into permanent wells, you would extend the period of exemption?—Yes.

100. Q. I suppose the same concession would be extended to those who construct durable wells?—Yes. They will have an extra longer period of exemption. I mean those who construct durable wells in the first instance.

101. Q. In Nimar almost the whole of the irrigation is from wells?—Yes.

102. Q. And the number of durable wells has almost doubled during the past ten years?—Yes.

103. Q. And that without the grant of any local advance?—Yes.

104. Q. The number has increased from 1,000 to 1,800?—I am afraid I cannot vouch for the accuracy of the figures. That is not a matter to which much attention was paid.

105. Q. Nevertheless don't you think that with liberal remissions you would be able to increase largely the number of durable wells?—*Kachcha* wells in Nimar are as durable, in a sense, as *pakka* wells. The only difference is that the *pakka* well is permanent and the *kachcha* well would last for a limited, though substantial, time.

106. Q. You would increase the number of *kachcha* wells?—Yes. As I said before, it is the tenant's self-interest rather than a prospect of remission, which induces him to make a well.

107. Q. With the grant of loans you could increase the number?—Yes. Everything helps, but I do not think loans form a great inducement.

108. Q. In the district note, Mr. Harriott says that 74,000 acres can be protected by irrigation works. He says "Excluding any additional area that may become available for irrigation owing to change in cropping, there are 74,234 acres to protect, for which irrigation works may be provided." I think great facilities exists in the Nimar district for the extension of wells?—I think I have already mentioned the practical difficulty in extending wells. You never know when you hit upon hard rocks which stop your wells. If the rock is very hard, the ordinary tenant gives up the site. Unless we help with improved methods of sinking he will leave his well alone.

109. Q. In such cases you think that the Government might give him help?—Yes.

110. Q. Has blasting been tried in any instance?—Only gunpowder blasting. I have never heard of dynamite blasting having ever been done.

111. Q. Are springs found below the rock?—Yes.

112. Q. (Mr. Muir-Mackenzie.)—The rock is generally trap?—Yes, very largely.

113. Q. Do they go below the trap? We find that in some parts of the Deccan they sink below it and they find a water-bearing tract?—They might do it towards the Nerbudda, where the trap tails off.

114. Q. On page 8 of the appendices of Mr. Sly's memo. I find that the area irrigated by wells exceeded 13,000 acres in 1898-99, whereas in the following year it declined to 5,266?—Everything was dry and there was no water.

115. Q. (The President.)—Did wells go dry also?—I was not there at the time, but I believe they did run dry very largely.

116. Q. (Mr. Craddock.)—You have in the Nimar district a small portion of wheat land in the Kanapur-Beria pargana which, I understand, falls within the alluvium of the Nerbudda valley and therefore is somewhat similar to the land in the Hoshangabad district. Did you find any wheat irrigation in that tract?—Very little. There is some, about 1 per cent.

117. Q. In this black soil tract wheat will grow without irrigation?—Yes.

118. Q. Do you find that well-irrigation for wheat in the rest of Nimar is chiefly applied to land where wheat would not grow without it?—Yes.

119. Q. Therefore you do not think that you could argue from well irrigation of wheat in Nimar that a similar practice might be extended in Hoshangabad?—Certainly not.

120. Q. But in the black soil of the Kanapur-Beria pargana of Nimar you found wheat irrigated from wells?—Yes. But where they have wells, they grow vegetables in addition to the irrigated wheat.

121. Q. In the other part of the district they use wells only for wheat?—In the trap area they usually have a mixed crop on the irrigated area. They irrigate wheat and vegetables.

122. Q. Well irrigation is much more extensive in the trap area than in the Kanapur-Beria area?—Yes.

123. Q. What is done to extend and encourage irrigation in the rayotwari tract of Nimar?—There the cultivation is just extending; I only know part of the tract, but I believe there is virtually no irrigation. Irrigation will come when the unoccupied land has been taken up.

124. Q. You apparently say that it is more profitable to grow rice followed by wheat than to grow cotton?—Yes.

125. Q. Do you think that if the Government should give a large supply of water for irrigation people would ever substitute rice and wheat for cotton in Nimar?—No, I do not think so. It is too much trouble.

126. Q. According to the figures you have given the Nimar cultivators are extremely wide awake. They would very much like to have a gain of Rs. 37-8 per acre?—They have got their hands pretty full with *juar* and cotton.

127. Q. You rather underrate the advantages of cotton and *juar* in the calculation you have given?—It is difficult to get away from their hereditary methods of calculation.

128. Q. Do you think it is not possible that you might have underrated the advantages of cotton and *juar*, for instance their bye-products?—The greater bulk of the bye-products of wheat and rice is set off against the greater value of the cotton seed. I have taken cotton, because on the whole it is a more profitable crop than *juar*.

129. Q. What I mean to say is that my experience of cotton tracts is that a good cotton field is sold for Rs. 1,000 for seven acres. I have never known such prices being realised for wheat-growing fields even in Pauni-Chouras. Your estimate for wheat and rice is more full than that for cotton. I only ask this question because it has been raised once or twice. Your figures seem to support the theory that had been advanced that cotton is less profitable than rice?—I cannot on the spur of the moment revise the figures in any way. These were worked out on the data available.

130. Q. Perhaps you have taken rather too low an average of the yield of cotton out of caution. You have been more cautious with your cotton estimates than you have been with your wheat estimates?—I have taken them on the same lines.

131. Q. You maintain them?—Yes.

132. Q. Merely because of the advantages of bye-products, the cultivators would stick to their cotton and *juar* although they may, if they choose to work it, get a better yield with wheat and rice?—Yes.

133. Q. I suppose in Chhindwara they might extend rice cultivation in the west of the Chhindwara tahsil. Were any experiments made in that direction in that district?—None. I see no reason why rice cultivation should not be extended.

134. Q. Did you see any good tanks in Chhindwara? There are three or four tanks but they are not much good.

135. Q. We made lots of tanks in the famine after your time. You did not see them?—No.

136. Q. Now that the railway is going to Chhindwara, there is great scope for well irrigation?—Yes.

137. Q. They pay a considerably higher irrigation rate for sugarcane in Chhindwara than in Nimar?—A good deal higher.

138. Q. What will be the excess?—I think they pay a water-rate half as high again as in Nimar.

139. Q. About Re. 1-8-0 or 2P?—Yes.

140. Q. Do you think that what Mr. Muir-Mackenzie was asking you about pushing *takavi* in Nimar would be feasible in Chhindwara?—It would be more feasible in Chhindwara than in Nimar. The only difficulty would be as to the crop to be grown under irrigation in the northern tahsil. The cultivators would

not take to irrigating wheat so long as they could go on without irrigation. Sugarcane is not profitable now. They might take to rice but not from wells. If they take to rice it will be a very good thing. They have paddy cultivation on the extreme eastern border.

141. Q. (The President.)—They are maize eaters?—They eat wheat and kodon.

142. Q. (Mr. Craddock.)—You think there is scope for extension of rice cultivation in Chhindwara?—Yes. Of course I do not know in the least how it would work.

143. Q. There have been a good many tanks made. You think that it is a country where you can have many tanks?—Yes. In the crystalline parts of Chhindwara, on the west there is no reason why rice should not be cultivated.

144. Q. (Mr. Muir-Mackenzie.)—What is the nature of the soil?—A sort of metamorphic soil, I believe.

145. Q. Is it sandstone?—No.

146. Q. It is not trap?—No. Chhindwara is cut up into two different sections; part of it is trap and part crystalline soil. In addition to this, it has one or two other geological formations.

147. Q. (Mr. Craddock.)—One point is whether wheat irrigation in Nimar does not give hopes of extending it in the heavy wheat lands generally?—I would not prophesy. It has not extended.

148. Q. Nimar is a district where wheat will not grow without irrigation?—Not in the bulk of the district. There is a distinction between using the water for a crop that would grow without it and a crop that would not grow without it.

149. Q. (The President.)—Can you suggest any means by which we can put to good purpose the water that goes to the sea in the Nerbudda and the Tapti. Can nothing be done with it?—Some geologists think that the Nerbudda used to run across Nimar into the Tapti valley, and it may still be possible to take Nerbudda water southwards; but it is a question of levels and the thing must be looked at from an engineering point of view.

150. Q. Black cotton soil is an obstacle everywhere?—No; the great bulk of the soil in Nimar is not black soil. Nimar is unlike Hoshangabad.

151. Q. The river is very deep?—Both the Nerbudda and the Tapti are very deep in their beds.

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FIFTY-SEVENTH DAY.

Jubbulpore, 14th March 1902.

WITNESS No. 24.—Mr. M. W. FOX-STRANGWAYS, I.C.S., Officiating Commissioner, Jubbulpore Division.
Replies to printed questions.

A.—GENERAL.

1. Q. To the Jubbulpore district, which I have known as Settlement Officer (1888-90), Deputy Commissioner (1897), and Commissioner (1900 and 1901).

3. Q.—(1) The effect of recent famine and scarcity has been a considerable reduction of the agricultural population through high death-rates, low birth-rates, and emigration. The area under cultivation has not yet been fully recovered, and I should say that the deficiency is most marked in tracts where irrigation is most required. For the present certainly sparsity of population would be an obstacle to irrigation of a kind requiring a large supply of labour. But the irrigation that would suit the district would not be of such a kind.

(2) No.

(3) No; it would probably not be possible to manure all the land that it would be possible to irrigate, but rice irrigation without manuring is still of great benefit.

(4) Yes. The whole of the "haveli" (nearly one-third of the district in area and much more in value of crops) consists of heavy black soil in which irrigation would do more harm than good. Here the place of irrigation is taken by the system of embankment known as "bandhwas."

(5) No.

(6) No.

(7) Possibly. Please see answer to Question 4.

(8) No.

(9) One obstacle is the practice of growing *singhara* (water-nut), a valuable food-crop, in tanks that might otherwise be used for irrigation.

4. Q. I think that the period of exemption should not be the term of one or more settlements (such terms being liable to alteration and having in recent cases been short), but a fixed number of years. With this alteration the system is, I think, sufficient in the case of small holdings, where the whole holding or the greater part of it is affected by the improvement. But in the case of a large holding, where only a part, though perhaps a considerable part, has been improved, the benefit is not apparent to the tenant. He probably finds the rent enhanced at the next settlement and the rent being nearly always payable on the holding, as a whole, he does not understand that the improved fields have been exempted. I cannot, however, suggest any alteration in the rules as regards improvements applying to single holdings, whether of *sir* or of tenancy land. But I think that improvements affecting a number of holdings or parts of holdings, such as a tank dug by a *malguzar*, might be more liberally treated, say by immediate remission of re-

venue, which would not carry with it remission of rents.

5. Q. Land improvement loans are generally taken for construction of field embankments, which may perhaps be looked on as a form of irrigation. They are not taken freely, but neither are they taken freely from money-lenders for such purposes. The reason at present is that few *malguzars* or tenants care to increase their indebtedness except for absolutely necessary purposes. As for the encouragement of these loans, I do not think that it is desirable to extend our operations very greatly. I think that loans under the Act should generally be granted only for the improvement of simple holdings, by embankment or well-digging. I do not think that in these cases any reduction of interest or remission of principal or extension of period is required (except, perhaps, in the case of wells, total remission in case of failure to obtain water). In the case of larger works, tanks or dams benefiting several holdings or a whole village, I think that some concessions are necessary if loans are to be made more popular. These might take the form of reduction or remission of interest, or partial remission of principal, or both. But I would not give loans at all, or very rarely, in such cases. I would get the work done as our village sanitation works are done, by *begar* labour supplemented by grants-in-aid. There would then be the following classes of works:—

- (a) Large works executed by Government, cost recouped by a water-rate or by enhancement at settlement.
- (b) Village works executed either by means of loans on special terms or by *begar* labour and grants-in-aid. The only return to Government on these would be increased security of revenue.
- (c) Small works to benefit individual holdings, executed without assistance or with the help of loans on ordinary terms. These would come under the Exemption rules.
- (d) Village works executed without assistance or with the help of loans on ordinary terms. On these remissions of revenue (not carrying remissions of rent) would be granted.

6. Q. No.

D.—TANKS.

23. Q. (1) The tanks are supplied by flow of surface drainage from the natural catchment area.

(2) The water is distributed by cutting the bund and flooding.

(3) In a year of scanty rainfall very few tanks, and in a year of drought none, would retain enough water for use in irrigation in September.

(4) Statistics for last year show it to be from 15 to 25 acres. Ordinarily there is none at all.

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24. Q. (1) Irrigated rice land almost always grow a second crop of some sort.

(2) Irrigation allows the substitution of the later and more valuable kinds of rice for the earlier and cheaper ones, and also of transplanting for broadcast sowing.

(3) (a) In a year of ample rainfall irrigation does not increase the yield of rice, and if it be applied to wheat it induces rust. (b) In a year of scanty and badly distributed rainfall, i. e., when the September and October rain fails, as last year, irrigation increases the yield of rice indefinitely. Without it the rice may yield a 4 to 6-anna crop or even less; with it the yield will be 10 to 14 annas. But irrigation can never produce a crop equal to that given by a good rainfall. In a year of scanty rainfall irrigation may be the only means of sowing the rabi crop in un-embanked land. (c) In a year of drought irrigation means the difference between a certain crop of some sort and none at all.

26. Q. No.

29. Q. There is practically no expenditure.

31. Q. Malguzars generally construct irrigation tanks for the benefit of their own *sir* land. But as the system is simply to cut the bund and let the water flow from field to field as far as it will go, I do not think that any serious trouble is likely to arise.

32. Q. Please see answer to Question 5.

33. Q. All tanks silt up in time, and this process is hastened by the practice of growing *singhara* in the beds. No steps are taken to prevent it beyond digging at long and irregular intervals.

1. Q. (The President.)—You are the Commissioner of this Division?—Yes.

2. Q. You have had a good deal of experience in this district?—I have been here three times.

3. Q. Have you served in many of the districts of the Central Provinces?—Not many. I was for three years in Raipur and three years in Chhindwara, one of the Satpura Plateau districts.

4. Q. Have you had any famine experience?—I was two months in Jubbulpore as Deputy Commissioner and two months in Seoni. That was in the first famine. Of the second famine I have no experience except as Officiating Commissioner in Jubbulpore for seven months.

5. Q. You say in reply to the first paragraph of Question 3, "The effect of recent famines and scarcity has been a considerable reduction of the agricultural population through high death-rates, low birth-rates, and emigration. The area under cultivation has not yet been fully recovered, and I should say that the deficiency is most marked in tracts where irrigation is most required." Do you know how much has been the decrease of population? Does it come to a large figure?

Mr. Muir-Mackenzie.—The Collector gave it to me. It is something under 10 per cent.

Witness.—That is for Jubbulpore. When writing that answer I was thinking rather more of the division than of the district. There has been a heavy decrease in other districts.

6. Q. You say, "For the present certainly sparsity of population would be an obstacle to irrigation of a kind requiring a large supply of labour." To what tracts are you referring?—As regards the district, I am referring to the Murwara tahsil, which is the northern part. As regards the division I was referring to Saugor, which is the extreme north, and to Seoni.

7. Q. (Mr. Muir-Mackenzie.)—The people are rather backward?—Not in Seoni. They are specially good rice cultivators.

8. Q. (The President.)—Is the irrigation that you have in your mind's eye tank irrigation?—Tank and nalla irrigation for Jubbulpore but not for Saugor. I mean the term irrigation to cover embankments.

9. Q. The *haveli* system?—Yes.

10. Q. You say, "The whole of the *haveli* (nearly one-third of the district in area and much more in value of crops) consists of heavy black soil in which irrigation would do more harm than good." I cannot differentiate in my mind the difference as regards the soil between the *haveli* system and irrigation. As I understand, the *haveli* system is to bund up about two or three feet of water and let that soak into the land and then you plough and sow?—You sow without ploughing as a rule.

E.—WELLS.

34. Q. I have collected some statistics for two Revenue Inspectors' circles in the west of the Sehora Tahsil. Excluding the *haveli* and the jungles, these are fairly typical of the district—

(1) 30—40 feet.

(2) Springs not liable to fail or become too saline for use in an ordinary year, but liable in a year of drought.

(3) 100 to 120 rupees.

(5) Mote and bullocks.

(6) } 1½ acres.

(7) }

35. Q. Well irrigation is confined almost entirely to sugarcane and garden land. Garden land cultivated by Kachis grows two or more crops, sugarcane land only one. The little wheat that is irrigated from wells is almost all grown as a garden crop. But in one village I found a considerable area of "sahra" (light sandy) soil growing wheat irrigated from wells.

38. Q. No. As far as I know, no assistance has ever been offered by Government or by local bodies for irrigation wells, nor do I think it would be useful.

39. Q. No. The people can do it much better themselves. The Government wells would be very expensive, often probably badly placed, and a constant source of trouble to the Tahsil officials and petty annoyance to the people.

40. Q. Yes. The Kachis' wells are as often *kachcha* as *pakka*. I do not think the encouragement of them is of any importance from an irrigation point of view.

11. Q. Wherein is the point by which it is adapted to black soil, whereas water flowing on the ground would not be?—All you want for wheat in that sort of country is the certainty of sowing—the proper condition of sowing. If you have been able to sow wheat properly in many years, even if you get no winter rains you get a fair crop. But if you have the light Christmas rains which until recent years we have been accustomed to, you get even a bumper crop.

12. Q. Suppose water was given previous to sowing from an irrigation channel or a flowing stream or a tank, would it not have the same effect as the *haveli* system?—I suppose it would. But it would be much more expensive. Jubbulpore *haveli* is an absolutely flat plain. It would be very difficult to apply water, while the *bandhwa* system is very cheap.

13. Q. Have you got any kind of information as to what the *bandhwa* system does cost per acre?—I suppose it entails a certain amount of yearly maintenance in keeping them?—Yes. The better the soil the less the cost of maintenance.

14. Q. That is done by the people themselves?—Yes.

15. Q. It does not cost them any money?—Yes. In a country like Jubbulpore where the *haveli* is an absolutely flat plain, the cost of maintenance is very small.

16. Q. How high are the bunds round the fields, about three feet?—Anything from two to four feet.

17. Q. But you do think that in heavy black cotton soil probably that amount of irrigation preparatory to sowing might be given without harm?—Yes, certainly.

18. Q. Is rice largely grown without irrigation in your division?—Yes.

19. Q. Merely upon rain?—Yes, broadcast.

20. Q. In reply to Question 4 in regard to a subject about which we have had a great deal of discussion, you say, "The period of exemption should not be the term of one or more settlements (such terms being liable to alteration and having in recent cases been short) but a fixed number of years. With this alteration the system is, I think, sufficient in the case of small holdings, where the whole holding or the greater part of it is affected by the improvement. But in the case of a large holding, where only a part, though perhaps a considerable part, has been improved, the benefit is not apparent to the tenant. He probably finds the rent enhanced at the next settlement, and the rent being nearly always payable on the holding, as a whole, he does not understand that the improved fields have been exempted." You say, "I cannot, however, suggest any alteration in the rules." Is there any means of showing it clearly enough so that the cultivators may understand it?—They are always given *sanads* which explain what is done.

21. Q. It is not in their comprehension all the same?—When their rent is raised and when they have to pay more on general grounds, they cannot understand

that but for the exemption they would have had to pay still more.

22. Q. In the case of small holdings, such as irrigation from a well, would you advocate the exemption from enhancement for a certain number of years, say 30 or 50, so that there should be no change whatever made in the assessment during that period? Suppose a railway came or a road was constructed, they would go on paying the same rate for a certain number of years. If that is done, would they understand the thing?—That would be preferable. The present rule works unequally, as the whole thing depends on the date of the next settlement.

23. Q. On the other hand do you approve of the Bombay and Madras system which gives a man exemption for all time from enhancement of assessment upon improvements?—No.

Mr. Rajaratna Mudaliar.—The land is treated as dry and is liable to such increase as other dry lands are. But there will be no enhancement on account of irrigation.

24. Q. (The President.)—In reply to Question 5, which says, "Are loans under the Land Improvement Act freely taken?" you say, "In the case of larger works, tanks or dams benefiting several holdings or a whole village, I think that some concessions are necessary if loans are to be made more popular. These might take the form of reduction or remission of interest or partial remission of principal, or both. But I would not give loans at all, or very rarely, in such cases." What is the class of cases that you are contemplating?—The case that I am thinking of, mostly in the Jubbulpore district, is the bunding up of a nalla to irrigate a whole or the greater part of one village or very often two villages where you cannot get the people to combine. That is, some lead has to be given by Government.

25. Q. In cases like that, you would rather not give loans? You further say, "I would get the work done, as our village sanitation works are done, by *begar* labour." Is that a machinery that is easily applied in these districts?—I cannot say easily applied for sanitary works, because we are working against the people, and they are not in sympathy with them. I believe for small works of this kind it would very often be very easy and popular.

26. Q. You mean for making the bunds of tanks?—Yes. But I do not think it would be possible for a large work.

27. Q. Has a *malguzar* got sufficient authority in his village to turn men out for a thing like that?—Very few, without assistance from Government.

28. Q. He wants that?—Yes.

29. Q. Then you divide works into four classes—(a) large works executed by Government; (b) village works executed either by means of loans on special terms or by *begar* labour and grant-in-aid; (c) small works to benefit individual holdings, executed without assistance or with the help of loans on ordinary terms; (d) village works executed without assistance or with the help of loans on ordinary terms. In the village works executed with *begar* labour or loans would you class works intended to benefit several villages?—I do not think it would be possible to carry out works to benefit several villages. They will have to be done either by Government entirely or under the system of grant-in-aid.

30. Q. In reply to paragraph 3 of Question 23 you say, "In a year of scanty rainfall very few tanks, and in a year of drought none, would retain enough water for use in irrigation in September." Is that the general experience here?—In the Jubbulpore district it is true. I have figures to show how far these tanks were used in two years. On looking at them I find that in the year 1899 these tanks were not practically used at all, whereas in 1901, 6,500 acres were irrigated from tanks and streams, which is more than three times the area that was ever irrigated before the bad years.

31. Q. A very sudden impetus has been given to the system?—Yes.

32. Q. You say in reply to paragraph 3 (b) of Question 24, "Irrigation can never produce a crop equal to that given by a good rainfall." There you refer to rice, I presume?—Yes, rice only.

33. Q. (Mr. Muir-Mackenzie.)—Not wheat, for instance?—I have no knowledge of wheat irrigation. It is only rice that was in my mind at the time.

34. Q. (The President.)—What do you think is the right policy for Government to pursue in order to make your division better fitted to meet a famine if it should happen again?—I think there are very few places in the division where any large projects, such

as those they have recently been prepared, look very promising; but it would be a good plan to start one or two in Seoni, which is the principal rice district, as experiments and examples. In the whole of the rice country in the Jubbulpore district, in almost every village where rice is grown, there is something to be done either by way of improving the existing tanks or by digging a second tank where the existing tank is used and must be used by the people for *nistar* or by bunding up nallas.

35. Q. Regarding them in the light of famine protection, these tanks are a broken reed on which you cannot depend on in famine?—Yes, in a really bad year.

36. Q. In a famine?—We had two famines, but the failure of rain was less complete in the first than in the second. A great many of them did a great deal of good in the first famine. In Damoh and Saugor there is an enormous scope for improving the land by embanking, especially in deteriorated tracts which are ruined by the growth of the *kans* grass.

37. Q. Would that be the Jubbulpore *haveli* system?—Not quite. The land is much lighter and more undulating. You never get a flat plain, and it is therefore much more expensive but less remunerative. It can be done and should be done.

38. Q. Would you give advances for that?—Yes.

39. Q. People themselves cannot afford to do it, I presume?—No. We are giving in Khurai, the most distressed tahsil of Saugor, special *takavi* advances to the extent of Rs. 25,000 without interest, but there is no remission of principal. The interest is entirely remitted. We are giving special terms in the hope of getting some big men to take them up and start the work.

40. Q. (Mr. Muir-Mackenzie.)—Have they been taking these advances freely?—No. I am afraid that the Khurai tahsil is in a terrible state. It has never recovered from the last famine. It is depopulated, and cultivation has gone down. There are very few men there who can be relied upon to do anything, but the Deputy Commissioner has got some men to take the loans, and I hope that the whole may eventually be taken. There are two witnesses who will come on Monday and who will be able to tell you something about it.

41. Q. (The President.)—Does the grant of advances without interest prove to be a great stimulus?—I do not think they would have taken it at all without that. It is the same system as was adopted here in the famine of 1896. We then gave out a large amount of famine loans without interest, and there was also a remission of 25 per cent. of the capital. They were taken freely.

42. Q. Was it utilised on protective works?—Fairly. Some of the loans were utilised in merely keeping the villages together. A certain amount of tank work was done but not well work. We got very little money back. In the Khurai tahsil, the present state is not a state of famine. If only people could get one good crop or two, we shall recover the money, and people will be encouraged to extend the embankment system.

43. Q. You think that is the true system to be adopted?—I think that is the only system to be adopted in Saugor and Damoh.

44. Q. The Saugor soil is not black cotton soil?—It is not the same as the Jubbulpore *haveli*, though it belongs to the same class.

45. Q. It has got some drawbacks to irrigation?—I should say it is not quite the same. It is a matter of degree. The soil is rather of a lighter kind.

46. Q. In considering these protective works, do wells not come in at all?—Wells in this district are used entirely for garden cultivation and nothing else. There are very few exceptions; here and there I have seen wells used for small patches of wheat. I never saw wells used for rice.

47. Q. The area attached to a well you put down at 1½ acres?—That is for garden cultivation. For wheat it would be more, and I should put it down at 4.

48. Q. With the lesson that these men have had in these late droughts, does not that rather turn them to wells, or do they look upon wells as equally futile? Do you think that, with experience, wells would be availed of in times of drought, or do you think that they would consider it too much trouble to get water from a well?—Well cultivation has been the monopoly of a certain class of cultivators. The ordinary cultivator is not accustomed to use wells, and he would not, therefore, use them. Of course it is much more expensive to get water from a well.

49. Q. Even if you had a free hand to advance as much money as may be required in the shape of loans,

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you don't think that will be largely taken up?—No, it will not be.

50. Q. What was done in this division during the last famine? What was the style of famine work?—In Jubbulpore it was mainly tanks. In the division, 144 miles of road were constructed and 266 miles of road raised in class. The actual cost was Rs. 4,00,000 which should have been at normal rates Rs. 1,80,000. That was a much better result than the first famine as regards the cost. There were 204 tanks made, of which 71 are now used for irrigation.

51. Q. That is about 3rd. What do you do with others?—They are used for *nistar*. They are quite small.

52. Q. These were all village works?—In Murwara tahsil, which was the worst affected, there were no public works, but they were all these tanks. The famine there was not so bad as in 1896, but it was still bad.

53. Q. (Mr. Muir-Mackenzie.)—I have heard very often that Murwara tahsil was the worst affected in 1896. I heard also that Murwara tahsil suffered less than others in regard to the decrease of population. Do the mortality returns show that?—Mortality returns show very high figures, but they are unreliable. There were a great many deaths among immigrants from Rewa. I know that Murwara did not suffer very much in 1899, but in 1896 it was the worst tahsil in the division.

54. Q. It is curious that it should not show itself in a reduction of population?—Yes.

55. Q. (The President.)—Have these districts come out with any really valuable addition to the public works, especially in the way of famine protective works?—Certainly not in the way of famine protective works. Generally the work done in 1900 was far better than that done in the first famine. A great deal of the work was very useful.

56. Q. I suppose you have a famine works programme?—They are not up to date, I am afraid, at present. We are rather waiting to see what help we can get from the projects drawn up for the Irrigation Commission, and what lines are going to be laid down as regards irrigation in future. There is a programme of road work, but that is of very little use. Nearly all the roads that are likely to be of any use are made. We are now making out lists of village works consisting mainly of small tanks and field embankments.

57. Q. What is the procedure adopted by the Executive Engineer in arranging for famine works?—With regard to road works, we have a road scheme for every district and we amplify it and make such additions as seem possible as famine works.

58. Q. That is only as regards roads?—Yes.

59. Q. Mr. Harriott has got dozens and dozens of projects. Would it not be good policy for the district authorities and Executive Engineers to adopt some of them?—I think nearly all of them should be put in as famine works.

60. Q. Would it not be advisable to put them in as famine works without waiting for any decision that the Commission might arrive at?—That is what I meant.

Mr. Craddock.—Mr. Harriott's tanks are put in.

Mr. Harriott.—They are put in at the end of this statement [handing in a statement].

The President.—This is corrected to the 1st of April 1901. I suppose it will not need much correction to bring it up to 1st of April 1902?

Mr. Harriott.—No. These tanks were put in a few days before you arrived in Nagpur.

61. Q. (The President.)—Who takes the initiative in the preparation of this programme—Is it the Public Works Department Officer or the Revenue Officer?—The Deputy Commissioner makes out the road programme in consultation with the Executive Engineer; and the tank programme, which will be more important in future, is made out entirely by the Deputy Commissioner and his staff. We have revived the procedure that was in force many years ago, when no one knew what famine was, that is to make out a list of possible famine works, village to village, and we hope that with the experience we have now gained, the list will be of some use. At present it is being done experimentally in typical circles.

Mr. Higham.—With reference to the question that the President asked you regarding the irrigation of wheat land by bandhs as compared with irrigation by channels from distant tanks, is it not one of the great advantages of the bund system that the fields are flooded to such a depth that the soaking destroys the *kans* grass?—Yes.

62. Q. If you have irrigation from flow it cannot destroy the *kans* grass?—No, there is no other way to get rid of it.

63. Q. If you irrigate fields by means of small channels from distant tanks and merely put a thin sheet of water upon them, could not the *kans* grass be got rid of?—I don't think it could be.

64. Q. You must have deep flood water?—Certainly, in areas which are liable to the growth of *kans* grass. In the north of Saugor, where there is *kans* grass, the only possible way to get rid of it is by embanking, and no irrigation from a distance would have any effect upon it at all.

65. Q. If you irrigate in the same way as you irrigate from canals, would it result in an increased growth of *kans* grass? Do you think it would increase?—I do not think it would. Generally if this kind of grass obtains a hold, it runs for several years (the people say twelve) and then it wears itself out. I do not know if irrigation would prolong its period, but it certainly would not do anything to shorten it.

66. Q. Was the removal of this grass ever undertaken as relief work?—I think so, in one case. I think such works were more common in other divisions than here. There was one case in Saugor, but it was no success at all.

67. Q. They were not successful in eradicating it?—They did not dig deep enough.

68. Q. I suppose it is not an easy form of relief work?—I think it is easy. It admits of simple measurement, when we have got the workers spread over a considerable area; and so far as it goes it is a very good form of work. But there is not much result.

69. Q. It is because you don't go deep enough?—Yes. You have to dig 4 feet. I do not know the details of management. I myself never saw the work.

70. Q. If you have rabi bund relief works, I suppose these works would be under the Civil authorities?—Yes.

71. Q. They are not included in the Public Works programme?—They have not been hitherto. But there is no reason why they should not be done by the Public Works Department. You have an enormous quantity of work in a small area and there is no reason why a large relief camp should not be formed.

72. Q. Is there a large quantity of work in a small area?—Yes. We had two such relief works in Saugor in the last famine. One bund employed, I think, 600 men for two months.

73. Q. The principal reason for not putting them under the Public Works Department is, perhaps, that the *malguzars* would be very much interested in the works, and you may rely on their agency to look after them?—Yes. That is one reason.

74. Q. How is it done? Have those works that have been carried out been done by the agency of *malguzars*?—One of them was, but I am not sure of the second. A *malguzar* was put in charge of the work and paid as an officer in charge.

75. Q. Were famine relief conditions carried out?—Yes.

76. Q. Did you ever give advances to *malguzars* to do the work with which they were entrusted?—I do not think that was done in any case in Saugor.

77. Q. All these works were small village works. There is no programme at present?—There is no complete programme.

78. Q. Has any programme been printed at all?—No.

79. Q. I understand that the Public Works Department have prepared a programme for large works in every district somewhat similar to this (showing a statement)?—There must be one for this district, but I have not seen it for a long time.

80. Q. Mr. St. Clair gave us an abstract?—But this list only refers to roads.

81. Q. There is something besides roads?—I may be wrong. I do not think there is any list of tanks prepared for these districts except those projects prepared in connection with the Commission. I have not got any list like this. [Mr. Harriott pointed out that the list of small village tanks was being collected for insertion in the programme.]

82. Q. What does the entry under irrigable area in Mr. St. Clair's statement mean (pointing out to an entry in the statement)?—That is not reliable. That is an estimate made by Revenue Inspectors of the area commanded by tanks.

83. Q. New tanks to be made?—Yes.

84. Q. The area irrigated is what was actually irrigated last year?—Yes. A great deal more would have been irrigated last year, but people were afraid to touch the tanks as they were Sirkar tanks. They would not touch them until the *hookum* was sent out. Otherwise the tanks would have irrigated 1,000 acres more.

85. Q. Were they afraid to open the tanks?—Yes.

86. Q. What were the orders?—They have been told repeatedly that the tanks had been made simply and solely for irrigating their rice lands.

87. Q. The expenditure on roads is given here. Have you got expenditure on the tanks?—No. It was far nearer the normal rates than the road expenditure.

88. Q. Is it in the famine report?—The road schemes and tanks would be found in the famine report.

89. Q. In Saugor district there is a much other scope for embankment?—Yes, than in any other district.

90. Q. You say that in the case of improvements affecting a number of holdings or parts of holdings, such as a tank dug by a *malguzar*, they might be more liberally treated, say, by immediate remission of revenue. The value of that concession would depend entirely upon the time that the settlement had to run, as the remission would only extend to the term of the settlement?—I did not mean so much the permanent reduction of revenue as the remission of the whole or part of that year's payment.

91. Q. That will only be another form of grant-in-aid?—Yes.

92. Q. (Mr. Muir-Mackenzie.)—Do you mean for a single year or do you mean a remission of a portion of the revenue?—I mean for a single year. The object is to make an immediate concession which they could see.

93. Q. It is not the same as Mr. Sly's proposal about giving them a *tukm* and a *muafi*?—No.

94. Q. (Mr. Higham.)—I suppose that in the case of an improvement that would affect a part of one holding, that would be the only form in which you would recommend assistance being given. You would not give a *sanad* exempting them from enhancement of assessment?—Do you mean a single tenant's holding?

95. Q. If a man made a tank which would irrigate only a small portion of his holding I understand you consider that it would be useless to give him a *sanad* exempting that portion from enhancement?—I don't think it would have much effect. I do not think they will value it very much. I do not propose to give remissions of rent in the same way as remissions of revenue are given.

96. Q. The only thing you would recommend would be to remit the revenue for one particular year, which would be another way of giving grant-in-aid?—Yes.

97. Q. Regarding village works and tanks to be constructed by *begar* labour—in consideration of the grant that is being made by Government you call it *begar* labour—I suppose it would be purely voluntary labour on the part of villagers? It would be given by villagers without compulsion?—I would only apply it where the majority of villagers wished it.

98. Q. If they wished it, they would find the labour?—Yes.

99. Q. There is no means of compelling them to find labour, I suppose?—There is no more power than what we have exercised in the case of sanitary wells. We used that system in regard to sanitary wells.

100. Q. Did they come largely?—No, because they did not like it, and did not understand it. In fact they were against the whole thing, and, therefore, we had to apply some pressure.

101. Q. Do you think they will come forward to do irrigation tanks?—I should not introduce them unless I knew the majority of the tenants and the *malguzars* wished to have them.

102. Q. They must settle amongst themselves how much labour they ought to supply and how many men ought to come?—Yes.

103. Q. They would come to District Officers for assistance?—I do not think you can work it at all without the close supervision of the *Tahsildar*.

104. Q. You will have to apply a certain amount of pressure?—Yes.

105. Q. You require no power beyond what you have got at present. Would you require any legislation?—No. If the work could not be done without legislation, I would not attempt to do it in this way.

106. Q. (Mr. Muir-Mackenzie.)—Can you tell me at all how far the area under the *haveli* embankments

was saved in the two famines of 1896-97 and 1899-1900. Can you say with any confidence that a smaller proportion of people went on relief or that a smaller proportion of the population was in the list?—Yes. A smaller proportion went on relief in both famines.

107. Q. It was, however, found by comparison that a larger reduction of the population was shown in the Sihora and Jubbulpore tahsils than at Murwara?—Yes. I cannot say what the explanation is. One possible explanation may be, the Assam cooly contractors have their head-quarters at Jubbulpore and their operations are conducted more in Jubbulpore and Sihora than in Murwara. It is certainly not due to the fact that the famine was more severe in Jubbulpore and Sihora. In the famine of 1896-97 they reaped, I think, almost a bumper wheat crop.

108. Q. In 1899-1900?—It was a poor crop, but not a bad one.

109. Q. More than 8 annas?—I think so. I cannot say with certainty. That is my impression, that it was 8 annas or more.

110. Q. There can be no doubt that in a year of drought the extension of the *haveli* system would be a very great protection?—Yes. But it must always be remembered that *haveli* cultivation is always liable to rust in wet years.

111. Q. As regards the *haveli* areas do they suffer from rust more than other areas?—Yes.

112. Q. Could that be remedied by judicious draining or cutting the embankment at the right time?—I do not think so.

113. Q. Can you say that famine has ever resulted from rust?—Not famine, but very heavy loss.

114. Q. Very heavy loss undoubtedly, but nothing like famine has resulted from rust. You regard rust as the lesser evil of the two if you extend *haveli*?—Yes. Though it may be a lesser evil, rust is a serious matter. All the troubles in Saugor and Damoh date from the time of the rust. Drought and rust have brought them into the condition they are in now. In the year 1894-95 we lost the whole of our *rabi* crop from rust.

115. Q. You are not afraid on that account to extend embankments freely in Saugor and Damoh?—No. You must trust the people. The fact that Jubbulpore *haveli* has been for many years embanked and is, no doubt, looked upon as the richest and the most secure part of the district, shows that, serious as the losses from rust are, they do not outweigh the advantages.

116. Q. As the country is so slightly different, do you think that Jubbulpore *haveli* suffered as much in a bad year from rust as Saugor and Damoh?—I don't think it did.

117. Q. It is a richer soil?—Yes.

118. Q. It would be an advantage, at any rate, to have a conclusive opinion on the point, after further investigation, before you undertake to extend embankments very largely in Saugor and Damoh?—Enterprising *malguzars* have been embanking for some time past, but they have suffered heavily from rust. But they are not deterred a bit.

119. Q. I have been very much struck, on looking at the figures given by Mr. Sly, at the small advances made for land improvement in the Central Provinces before bad years. What do you think is the reason?—Mr. Sly gives the right reason. People fear Government advances, because of the rigidity in collection.

120. Q. You do not think that owing to years of excellent rainfall they felt no need of them, and also the Government officers have not seen fit to push them forward?—That may be partly the reason, but the main reason is the one I have stated, when the people do take advances they take them for embankments and not for other forms of land improvement.

121. Q. Therefore they have taken very little for land improvement?—Yes.

The President.—Mr. Fraser gave another reason—the influence of the *Bania*.

Mr. Muir-Mackenzie.—The *Bania* is everywhere, especially in Bombay.

122. Q. At any rate, you think that the principal reason is the one urged by Mr. Sly?—I think so.

123. Q. Suppose you were given a free hand, how much do you think you could get rid of in an ordinary year in your division for land improvement beneficial to irrigation. I would not say wells or tanks or embankments?—It is very difficult to say just now.

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124. Q. Do you think you could get rid of 1/4th of a lakh?—Certainly not on the present terms, without remission or reduction of interest.

125. Q. In what way would you slacken the terms?—I would not recommend an increase of land improvement loans in this division at the present moment. People are not in a position to take them.

126. Q. You don't think that if you spread the repayment over a very long period of years people would take them?—The maximum term now is 35 years.

127. Q. But that is not the term usually given?—Very long terms are sometimes given. In going through *takavi* registers, I found old debts with instalments spread over 20 and 15 years.

128. Q. If you work it for the whole period of 35 years, it would make the annual payment very small?—Yes.

129. Q. How much is required to enable a man to make an embankment generally?—I cannot say; it varies so much.

130. Q. Do you propose to make advances particularly to malguzars if they are to make big embankments?—Yes. You will get full information about embankments from witnesses that come from Saugor. They took large advances and they made big embankments.

131. Q. In this district they make them small?—Yes. In Jubbulpore.

132. Q. If you give advances to tenants to make small embankments, do you not think they would take more money?—There is not much scope for the extension of embankments in the Jubbulpore district.

133. Q. With regard to the exemption of improvements from enhancements, Mr. Robertson says, "The existing provisions are sufficiently liberal. They are generally understood by the people, who in the Jubbulpore district readily apply for *sanads* of exemption." I understand you say that if there is general exemption of enhancement on the holding, the fact of the exemption would be obscured and the people would not understand it. From what Mr. Robertson says I gather that he is of a different opinion. I suppose it may be taken as tolerable evidence of the people understanding it, that they apply for *sanads*?—Yes. His experience of Jubbulpore is more recent and detailed than mine. But I should imagine that his opinion refers to exemption given for large improvements.

134. Q. Generally to malguzars?—I cannot say. I suggest that it might be so.

135. Q. On the other hand, is it not the case that the rents in Jubbulpore and in certain parts of your division are so low that exemption is a matter of little concern?—Yes.

136. Q. Is it not the case that the amount of advances is limited to a multiple of the rent?—Yes.

137. Q. Do you think that it is essential to maintain this limit?—I think there must be some limit laid down.

138. Q. If you have got good collateral security, why should you not go beyond that? Would you not advocate any boldness in that matter?—I have not considered that much. It is necessary to have some limit for guidance, though I think it does work rather hardly in some cases.

139. Q. In the case of tenants, it is a very low limit?—Yes.

140. Q. With regard to the question put by Mr. Ibbetson to several witnesses elsewhere, do you not think that in reckoning the value of the security you can take the value of the land as improved? You generally reckon the value of the land as unimproved. Suppose you construct a well, a bund or a tank, the question is whether you should not take the value of that improvement in reckoning the value of the land as security for the loan. Do you think it a rash thing to do?—I think it is a good suggestion.

141. Q. Mr. Fraser informed us that at Jubbulpore great facility was found in the matter of estimating security and making enquiries, by a village being generally induced to stand security for particular men?—You mean for agricultural loans?

142. Q. Yes. Do you think that system could be worked up for land improvement loans taken by tenants?—I do not think so.

143. Q. Why not?—You mean that for large works all tenants should stand security for a thing like a tank in a village?

144. Q. Yes?—I do not think you would ever get them to agree to do that. There has been a good deal of trouble in some places about joint security bonds in regard to tenants' agricultural loans. It is much

simpler to get them to agree to stand security when only a single crop is concerned, as the whole thing is over in a short period, than to make them agree to do it for a long period.

145. Q. But a great majority of them would also benefit?—Yes. People who would not otherwise get a loan would get the benefit of it. Is that what you mean?

146. Q. Yes?—I have not considered the matter.

147. Q. As regards *begar*, would it not be very difficult to get labour from those who do not get any benefit from irrigation?—It would be impossible in some villages. The villages would have to be selected very carefully.

148. Q. You cannot restrict *begar* labour to people who derive benefit from the tank. You must get it from the whole village?—In many cases we should get it from the whole village. The general rule is that the holdings are scattered and every tenant has one field or more under the tank or in the neighbourhood of the tank.

149. Q. You say that in regard to large works executed by Government the cost could be recouped by a water-rate or by enhancement at settlement. You could not make an enhancement for water advantage given during the currency of the settlement?—I think it could be done, but it would be very troublesome and very unpopular. I think that if we construct an irrigation work we should wait till the next settlement for enhancement.

150. Q. You will forgive me if I trouble you with a question about wells. You have given the levels as 30 to 40 feet. Is there any part of your division in which it is higher than that?—Yes; I think the northern part of the Murwara tahsil. I have not got figures, but from my recollection as Settlement Officer I think it was a good deal higher.

151. Q. In other districts?—I do not know enough about it.

152. Q. You do not know the levels obtained in digging wells for sanitary purposes?—I am confident that there are many places where it is higher.

153. Q. I noticed yesterday evening that it was very high in *kachcha* wells?—The neighbourhood of Jubbulpore is one of the places where it is high.

154. Q. I may, at any rate, hope that there are other cases?—Yes.

155. Q. Do you know whether famine work camps were principally supplied from wells?—Yes; they were.

156. Q. Did people drink well water in the villages or tank water?—Well water.

157. Q. I understood you to say that there would be no use in extending irrigation to Saugor and Damoh. Why do you say that?—I cannot claim that my opinion is worth anything. It would be an entirely new thing. I would myself far prefer to go in for embankments to the utmost possible limit. I cannot say that wells might not succeed.

158. Q. If wells did succeed, which do you think is a better protection against famine? Suppose you get 10 per cent. of the area under wells, which do you think is better—wells or embankments?—Embankments. My main reason is that in Saugor and Damoh wells are no use in eradicating *kans* grass.

159. Q. Anyhow you cannot get people to take money?—No.

160. Q. Are they of any use in other districts?—I should not think so. I should say less in Seoni than here. The Deputy Commissioner of Damoh mentioned the case of a village in the extreme north-west where they grew a great deal of wheat under well irrigation and the village was of quite a different character from others.

161. Q. Do you think that there is any chance of extension?—As a matter of fact, it is an isolated village surrounded by Panna territory.

162. Q. Mr. Robertson thinks that there is a chance of extension of well irrigation if the Murwara tahsil?—Yes; there the level is high.

163. Q. I saw some wheat under well irrigation, and the malguzar of the village told me that they have 15 or 16 wells sunk?—You mean at that village that you stopped at?

164. Q. Yes?—In that and the 2 or 3 neighbouring villages they irrigate light soils and grow wheat.

165. Q. There was a system followed in certain parts of Bombay during the last famine that reminded me of the Murwara tahsil and some lands immediately round here. Large sums were spent in digging *kachcha* wells which were of great use in providing fodder for

cattle amongst other things. Do you think that there is any scope for that in any part of your division, particularly in this district? With light soil and water near could not *kaachha* wells of the kind I saw yesterday be dug?—I cannot say that they would not be of any use, but I have no great reason to think that they would be.

166. Q. (Mr. Rajaratna Mudaliar.)—Have the tanks begun during the last famine all been completed?—No.

167. Q. How many are there which remain to be completed?—I do not think I could tell you that exactly.

168. Q. Roughly?—The tanks that we made during the last famine, with the exception of a few, were mostly in the Murwara tahsil. There were 54, half of which have been completed and the rest were left in order to allow the bunds to settle before they put in the sluices.

169. Q. Do you propose to take up the works and complete them at an early date or to wait for another famine?—I think those that are likely to be of any use are being gradually completed by *malguzars*. I should not propose to do any more than that.

170. Q. It is not proposed to spend any Government money on them?—No. I think we shall get better profits out of projects investigated by officers on special duty.

171. Q. You have said in reply to the President that you are not in favour of the system prevailing in Madras or Bombay of granting permanent exemption from enhancement of assessment on account of improvements made by ryots. Are you not prepared to advocate the exemption even in the case of wells?—Not a permanent exemption.

172. Q. What is your reason?—I do not see the necessity for our giving up revenue; it is only justifiable when such a course is clearly necessary. But when sufficient inducement could be given by an immediate remission of revenue or a temporary reduction, there is no reason why a permanent exemption should be given.

173. Q. By permanent exemption we do not mean exemption from assessment for ever. It is only right to pay less than the full assessment. The dry rate of assessment that will be paid will be liable to enhancement at every revision?—In some cases, viz., in rice villages that they have been forming in Chanda and where you want to establish cultivation, it may be necessary as an inducement to establish a kind of focus and centre from which cultivation can extend. But in a district like this, I do not think that anything so liberal as that is necessary.

174. Q. Would not such an exemption tend to increase the number of wells?—I do not think it will make any difference. Quite sufficient inducement could be given by an immediate concession, and I would not go any further.

175. Q. In reply to Question 3 you say that there has been a large decrease in cultivation. I find from page 39 of the appendices that in the Jubbulpore division the total area of the *kharif* and *rabi* has declined from 4 million acres to 3½ million acres?—Yes.

176. Q. And the decrease is very largely in the wheat area?—Yes.

177. Q. Is it due to the effect of famine or is it due to the growth of the *kans* grass?—Both, to the *kans* grass and the reduction of the population.

178. Q. There was loss of revenue owing to the decrease in the cultivated area? Yes; very heavy loss.

179. Q. Have you any rough idea of the amount of the loss?—The revenue of the Khurai tahsil, one of the four tahsils of the Saugor district, is less than one-third of its previous revenue. That is in addition to the remission of a single year's payment, which was given more than once. I cannot give you the exact figures. The present revenue is, I think, Rs. 50,000 as against Rs. 1,70,000 and will remain so for the rest of the settlement.

180. Q. In answer to Question 4 you say that you would fix a term of years for exemption?—Yes.

181. Q. What term would you fix?—I really have not considered it.

182. Q. Suppose the period of settlement is 20 years, they would at present be able to get exemption for 40 years?—They might get it nearly for 40 years.

183. Q. Will you go further and say 50?—No; I would not go further than 40.

184. Q. What period would you fix?—About 30 years would be reasonable.

185. Q. After that period would you advocate the system of *muafi* grant or *tukum* grant which has been

recommended by Mr. Sly, viz., ½ remission permanently?—No; I would rather extend the period beyond 30 years, as much as may be necessary, and have an end to it at some time or other.

186. Q. What is the rate of interest generally charged by money-lenders in this division?—Anything from 1 to 2 per cent. per mensem.

187. Q. It is not less than one rupee?—It is not often less.

188. Q. In answer to Question 31 you say, "*Malguzars* generally construct irrigation tanks for the benefit of their own *sir* land." Is there any difference made in the matter of exemption when the land benefited by the works is *malguzar's* own *sir* land and when the land benefited is tenant's land?—Yes. The *malguzar* will only get the remission from wet rate to dry rate on the land which is in his own cultivation. But he would not get any remission on account of the tenant's land.

189. Q. The terms of exemption are, I suppose, the same?—The rule is that the land which is benefited by the improvement is assessed at settlement at dry rates and *sir* lands will be assessed as such. But the tenant will have to pay a higher rate to the *malguzar*.

190. Q. The period of exemption is the same?—Yes.

191. Q. In the Saugor district the *rabi* area was 726,000 acres in the year 1890-91. But it has declined to 300,000 during last year?—Yes.

192. Q. What is the reason of this immense decrease?—That is mainly due to the substitution of cheaper *kharif* crops for the more expensive *rabi* crops.

193. Q. There has been no increase of *kharif* crops?—There has been a general decline in the extent of the land cultivated owing to the difficulty of destroying the *kans* grass.

194. Q. I want to know the cause of the decrease under the *rabi* area?—The decrease is due to the substitution of the *kharif* crop for the *rabi*, which is cheaper for cultivation, and also to the difficulty of getting the *rabi* seed.

195. Q. Unlike most other districts in this province, Saugor shows a larger number of durable wells than temporary wells?—Yes.

196. Q. There are about 2,000 durable wells as against 1,500 *kaachha* wells. What is the reason of that?—I could not give any reason with certainty. But one reason may probably be that they can get good stone for lining the well.

197. Q. If that is so, is there any scope for increasing the number of durable wells by the grant of *tukari* on favourable terms?—No.

198. Q. In spite of the facilities that exist, you don't think there is scope for increasing the number of wells?—As in other districts in this province well irrigation is there confined to garden and sugarcane.

199. Q. In Seoni on page 7 of the appendices, 2,411 tanks are shown against the year 1894-95, whereas in the preceding and succeeding years the number was 500 and odd. Do you think that the figures can be accepted as correct?—Certainly not. They are obviously wrong.

200. Q. There are also discrepancies as regards wells. In the year 1891-92 there were 1,595 wells, whereas in the years preceding and succeeding it, there were 600 and odd wells?—I cannot explain these figures, I am afraid. You have the Deputy Commissioner of Seoni coming on Monday and you can ask him about it.

201. Q. (Mr. Craddock.)—In regard to this *begar* labour that you spoke about, don't you think that you dwelt too much upon the unpopularity of wells that you made? What I mean is the only difficulty was that the low-caste people were not allowed to take water out of some of these wells?—There are many cases in which the system was worked with great success, I mean in regard to sanitary wells. I only meant that as a general rule people did not understand us and were against us. But here they will be with us.

202. Q. You recommend it for small works such as the bunding up of nallas, etc.?—Yes.

203. Q. You would not recommend it for big tanks?—No.

204. Q. Do you think that the Government might contribute to the maintenance of these dry tanks not so much in Jubbulpore as in Raipur of which you have had long experience and perhaps in the Wainganga district? We have heard in evidence that there are many tanks that do not ever contain the water that their catchment brings them, or they are not large enough to hold the water that comes, or they are in

Mr.
M. W. For-
Strangways.

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Mr.
M. W. Fox-
Strangways

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disrepair and are not properly sluiced, or they are in charge of men who are indebted. Do you think that the Government might make a contribution just as they did for village works in famine or might undertake to make provision to improve the system of village irrigation?—Do you mean to a large extent or just here and there?

205. Q. Suppose there was one or one and a half lakhs a year to be devoted to this purpose—spend 500 on this tank and 1,000 on that and so on?—Including embankments in rabi districts?

206. Q. Including that also?—I should think so. I would work that along with this *begar* system. I would get as much as possible from the people.

207. Q. It has been suggested that as a good deal of the revenue is built up on the rentals derived from these tanks, the Government might contribute much more to the maintenance of village tanks than they have done in the past. The idea that they should contribute is novel and that was only started in the last famine. Would you recommend the contribution?—I agree to the principle of that.

208. Q. How have you recorded the tanks that have been made? How has the land under the tanks been recorded?—As Government property, I think.

209. Q. Was any sort of *razinama* taken from the people whose land has been submerged?—No; I think very little land was submerged. They are mostly high-lying tanks which did not submerge wheat land. But I do not think that anything like a *razinama* was taken. I am not sure.

210. Q. The bunds that you have spoken about in Khurai, are they much bigger than the *haveli* bunds?—Yes.

211. Q. Much more expensive?—Yes.

212. Q. But there is one disadvantage. You do not have a catch crop of rice as you have in *haveli*?—Yes.

213. Q. Do you recommend them mainly to extirpate

this grass or with the view of increasing the permanent revenue?—I should recommend them in any case, but now mainly with the view of removing the *kans* grass. We are anxious about that.

214. Q. Don't you think that the danger of rust is greater than you represent?—It has, until recent years, been the principal danger in rabi land. But drought has now become a greater danger.

215. Q. You have some interesting figures as regards Jubbulpore which show how irrigation has increased between two settlements and since the droughts?—In the settlements of 1868 the area irrigated was 1,896 acres; in the second settlement of 1890 or thereabouts 2,831 acres; in the year 1898-99 which was between the two families 2,500 acres; in the year 1899-1900 which was the year of great drought 3,100 acres, and last year 1901, 6,400 acres.

216. Q. You find that during the course of the settlement there was practically no increase?—Yes.

217. Q. And the desire to irrigate now is based upon the experience of having more droughts than rust?—Yes.

218. Q. Whereas, during the 30 years' settlement there was probably more rust than drought?—Yes. But I do not think the question of rust comes in at all. These figures do not refer to wheat land but to rice land.

219. Q. I thought you referred to both?—Only 100 acres was wheat land; practically the whole of it is rice.

220. Q. The point I was enquiring about was whether taking the past experience, you would still recommend very strongly the bunding up of land?—I should. I am sure that much harm is done by rust, but at the same time it is impossible to believe that the Jubbulpore *bandhuas* system would have gone on from time immemorial if it had not been a really sound and remunerative form of cultivation.

WITNESS No. 25.—MR. RIKHI RAM

Mr.
Rikhi Ram
Naik.

14 Mar. 02.

To Mr. Craddock.—I am Malguzar of 25 villages in Marwara and Sehora tahsils, the chief crops cultivated are rice and wheat. There is some irrigation from new *bandhs* made in the 2 or 3 years. There was none before. I have spent Rs. 40,000 on *bandhs* and bunding nallas; not for direct irrigation; 2,000 acres have been benefited by the works; 800 or 900 acres are under two bunds; the soil on one is light and on the other black soil but not rich black soil. I am afraid of rust; it spoiled my crop last year; it comes very seldom. There was not the same desire for *bandhs* before the settlement and before the dry years. There was damage by rust in 1900 and in 1894, that is, in two years in the last settlement of 10 years; during the previous settlement of 30 years I remember only one year of rust. I have made many wells, but they have been of no benefit owing to the great depth of the water and the stoppage of opium cultivation by *kachhis*. The water is 45 to 70 feet deep and there is very little water. The wells are

Naik, Malguzar of Marwara.

both *kachcha* and *pakka*. I have used them for irrigating rice and for *paleo* of wheat with one or two waterings afterwards.

To the President.—The *bandhs* are repaired every year at a small cost. The work is done by my tenants.

To Mr. Craddock.—I went to see three of the Government tanks at Pali, Khan and Baruli which were partly made in the famine and sent in a report to the Tahsildar. The people will pay nothing for the water now; when they see the benefit of it they will pay twelve annas an acre for the watered fields. The present rate is eight annas.

To Mr. Rajaratna Mudaliar.—I did not make the wells myself, they were in land which I took. I could not take any more *takavi* now owing to the trouble I have through bad seasons in paying back that previously taken for *bandhs*. There has not been a good season since the last settlement in 1892.

WITNESS No. 26.—RAI BAHADUR BIHARI

Rai
Bahadur
Bihari Lal.

14 Mar. 02.

To Mr. Craddock.—I am Malguzar of 40 villages in Jubbulpore, two of which are in the *haveli*. The soil is chiefly *kali bompas*. *Bandhs* are good in *kabar* and *mund* and all black soils. Two-thirds of this district are covered with *bandhs*; they might be increased 25 per cent.; the rest is uneven land. I have spent Rs. 50,000 on *bandhuas*; where the land is even the cost runs to 25 or 30 rupees per acre; and where the land is uneven to 50 or 70 or even 100 rupees as the land has to be terraced. Ordinary repairs cost very little, but the bunds often breach; the cost would be about 1 rupee per acre per annum on even land and 4 rupees on uneven land. The benefits are the removal of *kans*, the possibility of sowing in drought, not only the bunded fields, but also the fields below. Tenants are making *bandhs* in their own fields and where the land is flat, not where it is undulating. *Kans* has greatly increased of recent years owing to the drought and the fields not being ploughed. Damage by rust is less than the benefits derived from embankments. In one of my bunds for a length of 50 feet the bank is 60 feet wide and the water deep enough to drown an elephant. There is less fear of rust in flat land; it is liable to start in depressions of uneven land. Making of embankments is not extending very much now. The recovery of *takavi* should be less rigid than it is at present; give more time for repayment and take no interest; the people cannot pay full value for money now; they are too poor; they are liable to lose a lot if the bank bursts. Rust is due to two causes—one kind to east wind, the crops are equally liable to this everywhere; the other

Lal, Landower and Khazanchi of Jubbulpore.

kind is due to wet and is more likely to start in the hollows of uneven land.

You can have wells in *dumat* land. I made one but cannot yet judge the results. The *Kachhis* have lots of wells in my villages. They irrigate rice and wheat and so get a second crop. Wells might perhaps be increased if the people were given grants-in-aid and very liberal *takavi*. Tanks are very costly; if Government make them and good rains come no one will take the water; not much good to make new tanks; better improve the old ones, put in sluices, etc., and give an example to the people. The people are not accustomed to use tanks for irrigation but started using them in the dry years and extend their use if Government assist; the people want example and help.

When *takavi* is given for wells the recovery should be in 15 years; no interest and remit $\frac{1}{4}$ of the principal. If Government recovers in 35 years then no need of remission but must not charge interest. There should be no enhancement of assessment on account of such improvements. People who thought they were going to get 20 years' exemption, got only 10, owing to the period of settlement having been lately reduced. It would not be a good thing to remit the principal and charge perpetual interest; it would be looked on as a permanent enhancement of revenue. Exemption for 30 years would be good. If the people see advantage of wells they will take *takavi* readily. At present the cultivators are too poor to do anything.

FIFTY-EIGHTH DAY.

Jubbulpore, 14th March 1902.

WITNESS No. 27.—MR. M. D. RATNAPARKHI, Extra-Assistant Commissioner, Narsinghpur.

1. Q. (The President.)—You are an Extra-Assistant Commissioner?—Yes.

2. Q. Attached to Jubbulpore?—No. I am attached to Narsinghpur district. But at present I am here on special duty in connection with railway compensation work.

3. Q. I suppose you have served for a long time in the Central Provinces?—Yes.

4. Q. What district?—Sambalpur, Damoh, Saugor and Nagpur.

5. Q. Have you been in the province during the settlement in the last two famines?—I was.

6. Q. Were you personally engaged in famine relief?—I had no famine work to do.

7. Q. You must have had full opportunities of seeing how the settlements were affected by the famine. I suppose you had to make large deductions?—Yes.

8. Q. You have been in Damoh, Jubbulpore, Nagpur and Sambalpur?—Yes. I travelled through the province as an Assistant Settlement Commissioner.

9. Q. You must have seen a good deal of black cotton soil in the valley of the Nerbudda and elsewhere?—I have seen.

10. Q. Do you think that in ordinary years there is any good done by irrigating black cotton soil?—In the Nerbudda valley districts they have a peculiar mode of irrigation. There is decidedly some advantage in irrigating by embankments and not allowing any other irrigation.

11. Q. How deep does the water lie in the embanked fields?—In some fields it varies from 12 to 15 feet.

12. Q. The ground slopes very much?—No, on account of high banks having been put up.

13. Q. They only put up these banks on sloping grounds?—No. As a rule they do not embank fields on sloping grounds. They put them on level grounds.

14. Q. What is the object of making an embankment so high as that? The rainfall falling into the fields would not fill so much as that?—It does, in a year in which there is good rainfall when fields are all full.

15. Q. When there is good rainfall you will have about 50 inches of rainfall?—Yes. The other object is to irrigate with the accumulated stock of that water the underlying fields also.

16. Q. The water falling directly on an embanked field could not give you more than 4 feet of water in depth seeing that you cannot have more than 50 inches of rainfall?—If the embankment is high there is more water. If it is more than filled they have an arrangement by which to let out the water so that it may not wash away the banks.

17. Q. (Mr. Craddock.)—A big embankment must get some water from elsewhere?—There are fields lying on the top of it. The water it contains is not merely the rain water that falls on it, but it is water brought in from high-lying fields.

18. Q. (The President.)—You say that the style of irrigation known as the *haveli* system is practised in the black cotton soil?—Yes.

19. Q. It does no harm?—It does not do any harm.

20. Q. If that can be practised, why should not tank irrigation be practised in the same soil?—In the first place there are no tanks constructed in the *haveli* tracts. It requires tanks at the foot of hills where the *haveli* tract lies, but no tanks are to be found there. Secondly, the tank water is not sufficient to irrigate black cotton soil, because in the black cotton soil there are generally big crevices, and if the water is let out of the tank a good deal of it is absorbed by the earth before it can go further. Black cotton soil consequently takes in all the water instead of letting the water flow from one field to another as in the sandy soil. Water is absorbed a good deal and hence they do not have irrigation from tanks.

21. Q. This *haveli* irrigation is for the sake of the rabi crop? Is it not?—Yes. They grow kharif and rice also.

22. Q. When do they sow rice?—In the month of July, or about that time.

23. Q. Have you had any experience of wells, of

districts where there are many wells?—I have seen districts having many wells.

24. Q. Which for instance?—Hoshangabad and Narsinghpur, where I have been four years.

25. Q. There are many wells?—Yes, a good number.

26. Q. Useful for irrigation?—Yes. They grow vegetables.

27. Q. Have you seen them grow wheat?—Probably I might have seen it in a field or two. They are mostly used for irrigating a crop of vegetables, etc., in the light soil, not black cotton soil. The soil is a mixture partly of sand and partly of clay.

28. Q. They have that soil in Hoshangabad?—Yes, besides this black cotton soil.

29. Q. Does that soil which you speak of as not being black cotton soil stand irrigation?—Yes.

30. Q. Would it do for tank irrigation?—Sandy soil is best suited for irrigation. For instance, in Sambalpur all the paddy crop is grown on sandy soil.

31. Q. Is there much of it in Hoshangabad?—Not to that extent as can be found in Jubbulpore. There are many vegetable gardens and kachwaras, as they are called, in which they have a particular mode of drawing water.

32. Q. In these seasons of famine that you have had, I suppose that a great number of tanks were dry?—They were dry. I was in the northern districts during the famine, and whatever tanks there were in the northern districts they were dry.

33. Q. Which do you think fail first—a tank or a well?—Tanks dry quicker than wells.

34. Q. Therefore in a time of famine a well is a more certain form of protection than a tank?—Yes, when these two are compared with each other.

35. Q. Since these famines, has there been any great increase in the number of wells?—No; not to my knowledge. As far as I could see there had been no increase.

36. Q. The agricultural classes do not show any desire for wells after the lesson they have learnt during the famines?—They may have learnt a lesson. But the famines have crippled their resources. Therefore they could not have their desires fulfilled.

37. Q. I suppose they will take *takavi* advances?—They first take them for seed grains, because that is a more pressing want than irrigation.

38. Q. If *takavi* is granted for wells will they take loans?—They will, provided certain concessions are made, but not under the conditions which are at present in vogue.

39. Q. What concessions do they want?—I mean to say that they have to repay the loans within a certain time; and as the time allowed is short, they fear that if the payment is not made in time some severe measures will be taken by Government for their recovery. This fear works upon them a great deal. There ought to be longer periods allowed for them.

40. Q. The legal period allowed is a very long one. Is it not 35 years?—Yes. They want a still longer period. If a well is sunk they do not derive any benefit from it immediately, and it is only after certain years that they begin to derive some benefit. If they are allowed some concession, it will be a sort of inducement for them to construct more wells. The present concession is not sufficient to create in them a greater desire for wells. We must give them some inducement.

41. Q. What inducement would create this desire?—If there be no interest for a certain number of years, they may go in for more wells.

42. Q. For how many years?—Ten or twelve years.

43. Q. And what else?—Suppose after a well is sunk no water is found and somehow or other there is a failure; the man must have some concession shown to him as regards the repayment of the money, otherwise it will be a great hardship.

44. Q. How many years would you recommend for repayment?—About 40 to 50 years.

45. Q. Do you think that the men would look upon it as a concession if the Government said to them

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you can give back this money whenever you like, but only if you do not like to pay it you must pay us the interest at the rate of 4 or 5 per cent., as the case may be, and as long as you pay that interest, you will never be asked to pay back the principal? Do you think they would consider that as a concession?—I am afraid not, because they will be incurring a sort of responsibility which they do not know when to discharge, inasmuch as they do not know when they will be able to pay the money. If they have a certain period stated to them, they will know within what time they would have to repay.

46. Q. Do you think that if these concessions were made more wells would be made?—I think a greater number of wells will be sunk. Many malguzars will come forward to sink wells.

47. Q. In some parts of India whole districts are irrigated by wells?—I know it is so in the Bombay Presidency.

48. Q. In the Punjab and various other places it is the same?—I only know Bombay.

49. Q. It is our duty as members of this Commission to enquire how to protect the country from famine. We find from you and others that the tanks which have hitherto been the chief protection get dry just at the time they are most wanted. There do not seem to be any facilities for making large canals, such as there are in the other provinces, and so one turns towards wells. Do you think that one could look forward to the time when wells would be so many as to protect the district?—Yes; excepting the *haveli* tracts. There will be a large number of wells in the light soil tracts if some concessions are made. In *haveli* tracts they will never think of digging a well, because embankments are better suited to their requirements.

50. Q. It is on black cotton soil?—Yes. Another thing about well irrigation is they think it a very expensive job. People do not care for it, because they have to keep a pair of bullocks. With regard to an embankment, which only costs them an initial outlay, they have to depend upon rainfall, and if they have some amount of rainfall their crops are safe.

51. Q. This *haveli* system is practised only in a small area in the Central Provinces—In Jubbulpore and some other districts?—Jubbulpore, Hoshangabad, Narsinghpur and Damoh.

52. Q. I suppose there is very little of *juar* and cotton grown in the Nerbudda?—Since the famine days they have commenced to grow *juar* where they used to grow wheat and gram, because they found that wheat was not a safe crop. If the rains failed they did not get it. In Saugor and Narsinghpur they are growing *juar* crop. In course of time they might again fall back upon wheat. This is only a temporary makeshift.

53. Q. (Mr. Muir-Mackenzie)—The unsafety which characterizes the wheat crop is to be found probably in the unembanked areas?—Yes. In the unembanked fields they have had some loss of crops in these famine years when they did not reap such a good crop as was reaped in the embanked fields.

54. Q. Did the embanked fields produce much better crops than the unembanked fields?—Yes. In a very few embanked fields they commenced to grow *juar*. Most of the *juar* crop is grown on partly embanked and partly unembanked lands and in totally unembanked lands.

55. Q. (The President.)—There is no cotton grown in this part?—There is, but a very small quantity.

56. Q. Is there much sugarcane?—That is also in a very small quantity.

57. Q. Does it not pay?—It does pay. But they do not care to have it, because there are not so many wells to irrigate it. In the Jubbulpore District they have given it up.

58. Q. (Mr. Higham.)—As regards the *haveli* bunds when a man makes a very high bund, where does he bring water from to his fields?—I suppose it is from fields on the sides?—From other fields lying at the top of that field. He also brings in water from the side fields.

59. Q. If you make bunds all over the place would not one bund interfere with the supply of water to another bund?—These big bunds are not made throughout the village. These big bunds are comparatively a few in number.

60. Q. There is a limit to which bunds can be extended, because they would interfere with one another?—Yes. They raise bunds according to the situation of the water. They do not have bunds where there is ample water. In those places they raise them to 6 or 8 feet.

61. Q. If one man makes a bund does not another man complain that it has stopped the water that ought to have come down to his field. Have such complaints ever been made?—No.

62. Q. No difficulty of that kind?—No; because they make a sort of compromise. One man tries to assist the other. They have bunds in such a form that the water goes from one field to another.

63. Q. It is because you have only a few bunds. Suppose they double or treble the number of bunds?—In Jubbulpore there are a number of bunds, but I did not hear of any complaint, because they suited each others convenience.

64. Q. (Mr. Muir-Mackenzie.)—Do you think that the embankment system could be profitably extended to a large extent in such a district as Saugor?—I think it could be extended profitably.

65. Q. There is not much level land in Saugor?—There is a certain proportion of level land. In the tract where the land is not level, it may not be profitably extended. There is a sort of valley between two hills, where the land is fairly level and there the embankment system might be extended profitably.

66. Q. Where the country is not extremely level but is undulating, can the system not be profitably extended?—No; because the water does not accumulate at a fixed height, the surface of the high land is scooped up, and the field gets spoiled. In the low-lying portion they do not have an equal distribution of water and the crops in the embanked fields are lost.

67. Q. On account of the breaching of bunds in a year of heavy rainfall?—They take care of the fields even if there be a heavy downpour. They will be by the side of the bund to see that it does not breach, because injury to a bund means serious loss, and they cannot repair it unless it be at a tremendous expense.

68. Q. If there is a tremendous rainfall, would it not breach?—They will suffer in that case.

69. Q. They never make any arrangements for overflow?—They have some arrangement on the one side or the other by which they let the water go.

70. Q. They do not build anything like waste-weirs?—They have some kind of peculiar masonry window in which a board is put, and as soon as they find that water is too much they pull up the board and let the water go, and only such water as is required is allowed to stop.

71. Q. Do they do this with reference to many bunds?—It is only the high embankments that want it.

72. Q. Do you think that poor people have their bunds insufficiently raised?—They are insufficiently raised. They might wish to have them raised.

73. Q. They might be assisted by means of loans to do that?—Yes. They do take loans at present for that purpose.

74. Q. Have you had much to do with the distribution of loans?—I did distribute loans for seed grains.

75. Q. In the famine?—Yes.

76. Q. Prior to the famine?—I had no experience.

77. Q. In years of short rainfall does the rice crop which they grow sometimes fail?—You mean in famine years?

78. Q. Not only in famine years but in years of short rainfall?—Rice seldom fails. If there is short rainfall they do not have a second *rabi* crop.

79. Q. They generally get plenty of water for rice crop?—Yes.

80. Q. I notice according to the figures given that there is a considerable decrease in the number of wells in the district of Saugor and in one or two other districts. What do you think that made the number of wells decrease? Is the decrease a genuine one?—The decrease is specially attributable to the present bad times. When people have not the means to attempt irrigation from wells, they give it up. Such irrigation means expenditure, inasmuch as a man has to keep a pair of bullocks and a man.

81. Q. Do you think that the decrease began only in famine years?—Yes.

82. Q. And sugarcane cultivation, we are told, has been abandoned in a good many districts. Is that the case?—It has decreased.

83. Q. What is the reason of it? Has it begun to decrease since the days of the famine or before?—It has been on the decrease for 10 or 12 years or even longer.

84. Q. What is the reason you think?—The various duties they have to pay. They have to pay for this thing and that thing, and thus they are troubled.

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85. Q. What are the various duties?—They have to bring fuel and shrubs for fencing, for which they have to pay.

86. Q. What do they have to pay?—I cannot tell you what amount they have to pay.

87. Q. It is not a big payment?—They have not such facilities as they had before.

88. Q. I believe they have to pay 8 annas a cart-load. If that is so, it is a small payment?—It is not this particular item of expenditure that they so much grudge as the circumstances attending the getting of these things.

89. Q. Do they find it difficult to get permission?—Sometimes there is a difficulty.

90. Q. Subordinates make it difficult to get the license?—Yes. When they go to the forest they sometimes go to a place which is prohibited and they are prosecuted and troubled. On account of ignorance they suffer a lot.

91. Q. Do you really think that is a serious cause of diminution in the cultivation of sugarcane?—That is the cause which has disabled them from obtaining these materials with which to protect their sugarcane gardens. As they are not able to protect them, they do not think it worthwhile to cultivate it, and they have, therefore, taken to other crops.

92. Q. I don't think that could be the cause. I have seen most abundant cultivation of sugarcane in places where there are no facilities for obtaining forest materials?—In these districts, unless they have a good fencing around sugarcane crop, they do not think they would have their crops safe.

93. Q. Don't you think that the more likely cause is the competition of cheaper *gur* brought in by railways?—I did not notice it. The trouble and expensiveness of the cultivation are the chief causes of the decline.

94. Q. Do you think that the figures regarding the decrease in the temporary wells in Hoshangabad are right, or are they misleading?—I cannot say that the figures are misleading. In Hoshangabad and Nimar there are a class of people called *Kachis*. They are people who grow vegetables when they find other crops fail. They must have taken to extended irrigation from wells by sinking a number of them to save themselves by garden and other crops, so as not to depend entirely upon rain-fed crops.

95. Q. The resources of these people were crippled as in other districts?—Comparatively speaking people in Hoshangabad are better off than in Saugor.

96. Q. You think they are more enterprising and more energetic?—Yes.

97. Q. Suppose cultivators were allowed to repay the loans in an indefinite period, would they regard it more or less as an incubus? They will be allowed to repay their capital whenever they find it convenient to do so, and will not be obliged to keep on paying interest for ever. If ever a man finds he had a good harvest and he was in a position to repay portion of the debt, he could hand in, if he chooses, some portion of the capital and get his interest diminished. Don't you think that would be a concession?—It would be a great concession; but still, I think, there should be some limit. The maximum period should be fixed within which a man should repay the loan. By fixing this period, it will bring home to him the fact that he has to repay the loan and he would know that by a certain period he would have to repay it.

98. Q. You think that some pressure ought to be put upon him to repay?—Some small pressure. They should know the responsibility they incur.

99. Q. Without that moral pressure you don't think he would repay?—Perhaps he may not.

100. Q. If it is not convenient for him to repay, why should the Government compel him to repay?—The period being sufficiently long, why should he not repay?

101. Q. What we want is to get people to take money. If a man thinks it more convenient not to repay the money in that fixed period, why should he not be allowed to pay whenever he likes, paying in the meantime the interest on the loan at 5 per cent? If it is more convenient to a cultivator to do so, why should he not be allowed to consult his own convenience? You think it would teach him to be unthrifty?—It would make him more careless.

102. Q. (Mr. Rajaratna Mudaliar.)—You said that 50 years' period would be a sort of encouragement to people. How long does a well last? Do you think it would last 50 years?—If it is kept in use and well looked after that may last 200 years. I have seen

wells lasting 200 or 300 years. Wells sunk by forefathers came to their grandsons and great-grandsons if the slight repairs that were necessary were looked after in time.

103. Q. The majority of your wells are not durable wells?—The wells that we are speaking of are for irrigation. They are *pakka* wells.

104. Q. So that you would limit your concession to *pakka* wells?—Yes, to wells costing about Rs. 400 or 500.

105. Q. Suppose wells got into disrepair and became useless within the period of 50 years, what would you do?—It would be a dead loss. If the cultivator keeps it in use, there is no likelihood of its getting into disrepair. If it is allowed to remain in a sort of dead condition, it is so much money lost. Trees will grow, bricks will fall, and holes will be formed.

106. Q. You advocate a very long period of 50 years. Will it not be dangerous?—If the irrigation is regularly practised, I do not think that will be a long period.

107. Q. Is your experience of the province such as to justify the belief that people will keep wells in good condition?—Ordinarily it would not be. But this is a sort of inducement to be proposed to the people to enable them to come forward. In ordinary times when people come forward of their own accord to take money, this may not be necessary. But when we want them to take loans, this would be a good inducement.

108. Q. In the case of these temporary wells what terms would you fix?—*Kachcha* wells can be sunk with 5 or 50 rupees.

109. Q. You would vary the period in the case of *kachcha* wells?—I do not think it is advisable to give money for *kachcha* wells, because there is no safety. If any loans are to be given they must be given for *pakka* wells. The wells will last for a certain time and give substantial benefit to the man who builds them.

110. Q. Are not loans given for *kachcha* wells?—Not particularly for *kachcha* wells. They take money for well-sinking and dig *kachcha* or *pakka* wells according to their means. No loans are given for *kachcha* wells as such.

111. Q. In times of famine were these *kachcha* wells of any use? Very large numbers were sunk in the recent famine. Did they last at least for a year?—Yes. They sank wells by the side of a *nalla* where they had sandy soil. They make a sort of ditch and draw water from it. Wells cannot be sunk everywhere. They have to select a particular tract where they could sink wells and then these wells last for a year or two at the utmost.

112. Q. At present some concession is granted in the case of private improvements for a certain period and that period is limited to the currency of the settlement and to the term of the next settlement. Would you extend that period of exemption as an inducement in addition to your proposal to grant 50 years for repayment?—I think the fixing of certain number of years, say 20, 30 or 40, as the period of exemption rather than the term of the current settlement and of the next settlement, would be more encouraging to them.

113. Q. The fact that they would not have to pay anything for 20 or 30 or 40 years would be more encouraging than the present system?—Yes.

114. Q. Would you fix the period at 50 years or would that be too much?—That would be too much. Forty years would be enough.

115. Q. Do you think that it would be too much considering that the ryots spend their own private capital?—After reaping the advantages for 40 years, it would be no burden on them to pay a little enhanced rate.

116. Q. We were told at Raipur that the granting of such a fixed period would cause inconvenience in preparing accounts and in other ways. Do you apprehend any inconvenience in the matter of settlement operations, if you fix a definite period of 30 or 40 years? If it terminates somewhere in the middle of the settlement, some inconvenience might be caused, but do you think that the inconvenience will be great?—These lands will have to be re-assessed at wet rates if they were assessed at dry rates. I do not think it would cause any serious inconvenience, specially considering the advantage that would be conferred on the people.

117. Q. You know the amount of re-assessment imposed at the revision settlement? The difference between that sum and the former rent is the amount of remission, would it not be easy to show that in the

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accounts?—Yes. It comes to the same thing as I mentioned. Our records are in such a condition that we can assess lands at any time.

118. Q. There has been a large decrease in the number of wells in Narsinghpur in the three years commencing with 1897-98. The number of wells exceeded 1,000 in that year and the two years preceding it, but in the succeeding years it has decreased by about 200. Do you happen to know what the reason is?—It is exactly the same reason as I told you before. Owing to bad times people had not the means of irrigating from wells. It is an expensive item to have a pair of bullocks and a man, and this they could not afford. The people of Narsinghpur find great difficulty in having their fields ploughed. There are no bullocks to plough the fields. How can they have bullocks for irrigation from wells.

119. Q. There is a large increase in Hoshangabad?—That I explained. It is due to the character of the Kachis.

120. Q. The average area irrigated per well seems to vary very largely. In Sambalpur the average area is less than half an acre per well?—Yes.

121. Q. Can you say what the reason is?—The wells in Sambalpur are called "Chuas." They simply dig with a pickaxe about 10 or 12 feet, and the soil being sandy they get water at that depth. They give it up at the end of a year. They are small and shallow and only used for very small areas.

122. Q. Temporary wells of Narsinghpur and Hoshangabad irrigate more than twice the area?—Yes; because these wells are more substantial than the wells in Sambalpur. These are much deeper and have some masonry work.

123. Q. In Hoshangabad the total area under occupation shows a decrease of nearly 230,000 acres during the last ten years. Do you know the reason for the decrease from 1,063,316 acres in 1890-91 to 833,905 acres in 1900-01?—Many tenants have relinquished their holdings and have gone off.

124. Q. In Narsinghpur there is a similar decrease? Yes. Several holdings have been surrendered. Some have died from distress and left no heirs.

125. Q. (Mr. Craddock.)—You said that you would have a long period of 50 years fixed for the repayment of *takavi* loans?—Yes.

126. Q. Do you mean that the last instalment should be paid by that time?—Yes.

127. Q. Don't you think that the last instalment is less important than the interval that lapses between the granting of the loan and the first instalment? Would it not be better to fix the payment of the first instalment five years after the construction of the well?—I think it would be better if no payment is demanded for ten years.

128. Q. The present rule is three years?—Yes. If the period be extended to ten years it will be an advantage. When a tenant derives benefit from a well for ten years, some instalment he may be legitimately expected to pay, and he would not find it a burden to pay it.

129. Q. Don't you think the Government would lose?—I don't think so, if you get sufficient security as we have been getting hitherto. There will be the well on which the money has been spent, the fields and other landed property which would be the security.

130. Q. New wells should be made in suitable lands?—Yes.

131. Q. What crops would they set to irrigate?—They will grow vegetables, *bhattas*, chillies and other garden crops.

132. Q. You don't think they will make wells for field crops?—Wheat or gram will not be suitable. They generally sink wells on sandy soil, and if wheat is grown there they might irrigate it.

133. Q. Do you think that you would be able to protect the country from famine? If you had a larger number of cultivators growing garden crops, it would not have very much effect upon the people?—In course of time they might begin to grow wheat also close by the well, but at present as soon as facilities are afforded to them they will start vegetable-gardens and *kachwaras*. They might rake to other higher crops also which may be a protection against famine troubles in course of time.

134. Q. You have seen the bunds made by Behari Lal?—Yes.

135. Q. These are very expensive works?—Yes.

136. Q. What do you think is the normal cost on the level land for making *haveli* per acre?—The cost

per acre is Rs. 4 to Rs. 5. That would be a decent rate. The rate of embankments in Narsinghpur is 30 cubits long, 5 cubits wide, and 1 cubit deep per rupee. If you spend Rs. 4 to Rs. 5 you will get a decent embankment. This rate is for fields already bunded a little. For new land Rs. 5 an acre would not be sufficient.

137. Q. (Mr. Muir-Mackenzie.)—What would it cost for an absolutely unreclaimed *tagar* land?—It may be about Rs. 300 or Rs. 400. It will be not less than Rs. 200 an acre roughly. The cost depends on the nature of the country.

138. Q. (Mr. Craddock.)—What is the average area of these fields? When you put up these bunds, how do you arrange with regard to your neighbouring lands?—There may be his own fields or else he would be improving other people's fields. There must be 4 or 5 acres within one bund. The maximum is 100 acres. There is one field like that near Mohinya station.

139. Q. Within one bund?—Yes. There are many such big fields in *haveli*. There is one near Mirganj. But such fields are not to be found in all villages.

140. Q. (Mr. Rajaratna Mudaliar.)—Does the water stand upon the whole of the 100 acres?—Yes.

141. Q. (Mr. Craddock.)—Have you seen the crop on Behari Lal's land?—I saw it in 1891-92.

142. Q. That happened to be a dry year. Do you remember that?—November 1892 was bad, but 1891-92 was a good year.

143. Q. Did you get better yields on those fields? What is the advantage of *banduar* fields over *tagar* fields?—The advantage is not less than 50 per cent.

144. Q. At the same time there is some saving in the cost of cultivation?—The embanked field does not cost so much for ploughing and weeding.

145. Q. You may set the cost of repairing the bunds against the cost of ploughing and weeding on *tagar* lands?—The repairing does not cost much.

146. Q. You might set it off against that?—Yes.

147. Q. Any saving in seed?—I do not think so.

148. Q. You said about fixing a period for exemption for improvements; you thought that it would not cause inconvenience?—Yes.

149. Q. What would you do in the matter of rent? If the tenant improves his land and the improvement is liable to exemption in the middle of the settlement you have also got to fix the *malguzar's* demand on it and you will have to alter the rental demand of the village and also the revenue?—Yes.

150. Q. You know what *muafi* exemptions are?—Yes.

151. Q. They are often overlooked because of a good deal of trouble?—Yes.

152. Q. If this system is extensively used, would it not be troublesome to keep the accounts during the whole period?—If the period be 40 years, it will nearly be the end of a settlement and the difference between the period of exemption and the term of the settlement will only be a short time and there will be no necessity for making calculations for the interval.

153. Q. Then would you say a fixed period plus the remaining term of the settlement?—That would be still better.

154. Q. It would save a lot of trouble?—Yes.

155. Q. (Mr. Muir-Mackenzie.)—If your period ended 2 or 3 years after the settlement, you would lose much?—Yes.

156. Q. (Mr. Craddock.)—Have you seen the Sambalpur district?—Yes.

157. Q. Have you seen wells used for rice?—No. But I was there for 7 years and made the settlement.

158. Q. Do they understand the advantages of irrigation?—Yes. Their whole crop is raised by irrigation.

159. Q. Irrigation by percolation is not shown in the revenue returns?—No. Because the whole of the paddy crop is under tanks, and irrigation by percolation is a necessary thing and not a special thing, and therefore it is not shown.

160. Q. (Mr. Muir-Mackenzie.)—Irrigation by percolation is not shown?—It is not shown.

161. Q. (Mr. Craddock.)—Where you get fields below a tank bund and no water is allowed into them, it percolates through the bund. Is not that area shown as irrigated?—I think it is not shown as irrigated.

162. Q. (Mr. Muir-Mackenzie.)—Do people come forward readily for *sanads* for exemption in this dis-

triot?—They do. They make applications immediately after they make improvements and ask for *sanads*.

163. Q. Is that the case all over the parts of the province that you know? Yes. All over the province they make applications. This thing has been made widely known to them and they put in applications for *sanads* to the Tahsildar as soon as they make improvements.

164. Q. Do you think they understand the value of a *sanad*?—They do understand it.

165. Q. After that the rent of the whole holding is enhanced?—Yes; it is enhanced.

166. Q. But does not that obscure the exemption?—They have the idea that the particular land on which improvement had been effected is not assessed at the rate at which their other lands are assessed.

167. Q. They do not really think that they are cheated?—They do not think so. If not, they would not go on applying for *sanads*. Eventually there is a lump assessment.

168. Q. You say that these people do not dig wells because they find that they could not incur the expenditure in bad times. The principal expense would be in maintaining cattle?—Yes; and also they have to keep one man.

169. Q. Cannot they do it themselves? Why should they maintain one man?—If they have to look after other things, they must have another man.

170. Q. In famine they would not have to look after other things as other cultivation would have gone?—They have to look after their house and other things.

171. Q. Would it not have been an advantage, in your opinion, if these people had dug *kachcha* wells in

such land as was possible at the beginning of the famine and grown fodder crop to maintain their cattle?—I do not think so.

172. Q. Why not?—In the first place in these times of distress a man wants to have some ready measure for his livelihood.

173. Q. He does not want to lose his cattle?—If he starves he does not care for his cattle.

174. Q. There are some people who do not go to relief-works?—If they do not go to relief-works they do something by which they earn a few pice.

175. Q. Do you think that loans would have helped a large number of cultivators to have dug plenty of *kachcha* wells and have grown fodder crops?—I do not think so.

176. Q. Do you think that there is much scope for extension of *bhandwas* in any parts of the province that you know, as there is in Nasik which you know?—I don't think so. The rivers here are not in such convenient situations.

177. Q. They are deeper?—In Narsinghpur they are deeper.

178. Q. Do you know the Marwara tahsil? Is there any stream?—There is no big stream.

179. Q. (Mr. Rajaratna Mudaliar.)—Before granting these *sanads* I suppose the improvement is inspected?—Yes. The Tahsildar has himself to go and see it and ascertain the amount that has been spent on improvements before the *sanad* is granted. In the first place the Revenue Inspector inspects the place, but no *sanad* is granted before the Tahsildar inspects it.

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WITNESS No. 28.—SRIMANT KETH SINGH, Malguzar of Khurai.

To Mr. Craddock.—I am a Malguzar of 27 villages in Khurai tahsil, Saugor district. I have embanked fields and made wells. Have spent Rs. 20,000 on embankments and embanked 600 acres since the famine. We did not make embankments before. They have proved satisfactory. We have had rust since. There was slightly more rust in the embankments, but on the whole embanked fields were more profitable. The yield is increased 50 per cent. by embanking. Cost of ploughing and sowing is reduced 50 per cent. Embanking is increasing in the Saugor district, and malguzars and ryots will with bunds embank fields. I have no objection to my ryots being given *takavi* for land embankment.

I have irrigated garden crops and wheat from wells. The profits from well irrigation are greater, but the expenditure is greater too. One well will irrigate 8 acres. The gross produce=Rs. 56 an acre of which Rs. 16 goes for irrigation.

In bunded fields costs of construction Rs. 25 an acre. Rs. 2 per acre per annum for repairs for 5 years.

After 5 years the people repair the embankments themselves. Yield has increased from 4 to 6 fold of the seed. It reduces the costs of cultivation 50 per cent. Embanked fields are more profitable.

I have sown *juar* and maize outside of the bunded fields. I do not irrigate these crops.

The Commissioner has ordered *takavi* to be given to the people in Khurai without interest. I have taken it, but other people have not, because for about 5 years they get no profit from the works. The subsequent expenditure for the first 5 years has to be continued and additional loans are needed further. He thinks the works should be calculated or estimated on D. P. W. rates and the loans given accordingly.

In the embankments "mogha" or outlets are provided to irrigate fields below. The prices given for embanking fields do not include the cost of sluices. Sluices are only needed in large embankments. I have made them in embankments flooding from 100 to 200 acres.

Srimant
Keth Singh.

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WITNESS No. 29.—SETH NATHU RAM SINGHAI, Malguzar of Saugor.

To Mr. Craddock.—I am Malguzar of 20 villages. I have spent 50 to 55 thousand rupees in bunding 900 acres. I have made this work before the dry years and during the last six years. I took up the work and for the advantage of the work and for keeping my villages together. I have found them profitable, they have killed *kans*. The high bunds, where the water is some depth, *kans* dies quickly but in less deep fields the *kans* is killed slowly. Some of my fields were breached and I lost the crops in them. I had sluices in the fields which burst but they were not big enough. Rust does effect bunded fields more but they suffer from rust seldom and they are more profitable.

I got Rs. 2,200 *takavi* of which I paid the first instalment after one year. It was one-fourth. I was remitted $\frac{1}{4}$ of the loan of Rs. 18,000 which was a famine loan.

Takavi should be given on more reasonable terms and be specially applied to the *kans* limits. The recoveries should not begin under five years.

I got Rs. 10,000 profit in one year but I made big embankments and killed the *kans* quickly, the poor people will not be able to make such large embankments.

Frost has damaged crops throughout the tashil, equally in bunded and unbunded fields.

Owing to the abandonment of large areas which have been taken up by tenants at one anna each, and no

The rents in my villages have been sustained by land improvements while those of other villages have been reduced.

Seth
Nathu Ram
Singhai.

14 Mar. 02.

WITNESS No. 30.—THAKUR NIHAL SINGH, Malguzar of Damoh.

To Mr. Craddock.—I have 2 villages in Damoh. I have made embankments in my fields. I have made embankments in black and light-soil. I have made these embankments during the past ten years they are extending in the Haveli and of Damoh too. I spent Rs. 1,000 in one place on embankments, and they cost me Rs. 20 per acre. Embanking fields is profitable. The cost of cultivation is much reduced. I have no irrigation wells in my villages, but I intend digging wells for irrigation. There is more profit from well irrigation in wheat. Wheat wants one watering when

necessary before sowing and two after sowing. I would give wheat on black soil two waterings every year. Till recent year we have had fair crops without irrigation and we have therefore not made wells. But bad years have shown us their advantage.

Re-payment of loans should begin after five years because it takes five years to kill *kans* and get full profits from the works.

Where there is well irrigation the cultivation is too great to allow "kans" to grow.

Thakur
Nihal Singh

14 Mar. 02.

FIFTY-NINTH DAY.

Jubbulpore, 17th March 1902.

WITNESS No. 31—MR. A. MAYNE, I.C.S., Deputy Commissioner, Seoni.
Replies to printed questions.

Mr. A. Mayne. 1. Q. Mainly to Balaghat and Seoni. Was Settlement Officer in Balaghat for over two years. Have been Deputy Commissioner of Seoni for nearly two years.

17 Mar. 02.

In dealing with irrigation I refer only to tank irrigation, save where I mention well irrigation, which is used only for garden crops.

3. Q. (1) and (2) Not as a rule.

(3) No.

(4) (a) *Nature of soil.*—Black-cotton soil is not necessarily unsuitable to irrigation. In the rich tract of such soil in the Dhansua and Hatta parganas of the Ballaghat tahsil, the cropping is mainly broadcast irrigated rice followed by urad sown *ultra* (broadcast among the standing rice).

As far as my experience has gone, the reason why black-cotton soil is not used for irrigated rice, where the climate is similar to that of the Balaghat valley, is mainly that the people are not rice-growers by caste or by the local custom of generations. Just as the cultivation of cotton and *juari* has spread, so it would be possible for the practice of irrigation of rice to spread to black-cotton soil tracts, which from the mildness of their undulations are irrigable. Such a change in the cropping and in the method of agriculture would, however, not be an *insurance against famine*, but would involve an increased risk of famine; for experience has shown that inasmuch as the irrigation of each year must of necessity depend mainly on the rainfall of *that year*, black or brown soil devoted to irrigated rice is more susceptible to famine than if devoted to unirrigated *rabi* crops.

Barra land (poor stony) soil is hardly irrigable at all. It is rarely level enough to make irrigation pay. It is very porous. It is used for crops which are more likely to suffer from excess of moisture than from too little, e.g., kodon, kutki, jagni, til, &c.

Sehar (yellow) soil is the rice land *par excellence*. It is not used for growing any valuable crop, save rice. Is not used for growing *rabi*. Should be irrigated wherever possible, as rice can always stand irrigation. The soil for transplanted rice.

Morand (brown) soil will grow rice or *rabi* crops. In the rice tracts it should be irrigated. Where rice is not the fashion this land is not irrigated and it is not found worth while to irrigate it.

Kanhar or *rabi* (black) soil is rarely used for rice, save in the tracts abovementioned. Grows good double crops (rice and pulse), but not the finest rice.

(b) *Slope of soil.*—Irrigation, save in so far as it depends upon caste or local custom, is a matter of the supply of water and of the slope of the ground. Much of the land is not irrigable, save at a prohibitive expense. The slopes are too steep or there is no suitable source of supply.

(5) The people are always willing to extend irrigation to sehar soil and often to morand soil. In the former case it is a necessity for good cultivation, since *rabi* crops cannot be resorted to. The obstacles to the extension of irrigation are the difficulty and cost of making a suitable tank. Where there is no *nalla* of convenient size, no irrigation is possible. If the land is too near the top of a catchment area, no tank is worth making. If it is too far, so that the only streams are violent river in the rains, no irrigation can ordinarily be made. Between these two extremes there are thousands of sites for tanks. There are very few sites for large tanks, costing over Rs. 10,000 say, as the slopes are too steep to permit of an irrigable area below such tanks large enough to make the project pay. Where the slopes are not steep, such tanks will, as a rule, submerge much valuable land already irrigated from smaller tanks higher up. There are few ridges of any considerable length along which water can be taken and while it is relatively easy to make fine tanks by damming mountain streams before they issue into the more level plateaux or valleys, it will frequently be found that the numerous undulations of the ground between the tank thus made and the land to be irrigated form so serious an obstacle that such projects could never pay interest or even repay the bulk of their capital expenditure.

(6) Persistent bad seasons and slovenly cultivation, which latter appears to be due partly to the bestowal of proprietary rights, have led to a good many tanks falling wholly or partly out of repair. To reduce the likelihood of famine it is as important to repair and improve the existing tanks as to find new projects; but there are some suitable new sites still available. Usually the tanks have not been made either because they concern several villages and need concerted action, or because the projects are beyond the means of the cultivators concerned. There is a lack of capital, owing to repeated famines. Where there is irrigation, there is rarely a lack of capital for the suitable cultivation in land previously cultivated, save for the first two or three years after a famine, but the breaking up a fresh land below a newly-constructed tank is costly.

(7) I have never heard this complaint.

3. Q. (8) No.

(9) Already answered in so far as the taste of the people is an obstacle, or the kind of cropping is one and often in the latter case a valid one.

4. Q. I do.

5. Q. Since the famines there is less reluctance to take loans for land improvement; but in view of their present indebtedness many cultivators are unwilling to borrow in order to construct tanks which may involve them in fairly heavy expense and which will not necessarily bring in a large return, unless they have large rice areas in their own cultivation below the tank. If the *malguzar* makes a tank, tenants will not much pay for water, save in years of failure of rain. These are still the exception. The irrigation of one's own rice land is a prudent method of investing savings and may justify raising a loan. The irrigation of other people's land will rarely pay, for in many years they will give little for the water, and in the years when they would give much, there is usually none to sell them.

Irrigation of rice is mainly of value in enabling better cultivation. It is a *partial* safeguard against famine. With such land as we have, it can only in rare cases be a complete safeguard.

(1) I think the rate of interest might well be reduced to 3 or 4 per cent. Government expenditure on such loans should be repaid; but it does not seem necessary that Government should make a profit out of them. There are of course occasional bad debts—cases in which the borrower has to be recommended for remission although his proprietary rights could be sold for default of payment, so that if the money is lent at the rate which Government will pay for it, there will be some loss to Government.

(2) I would only recommend remission of interest where persons are to be induced to take loans in famine time to provide employment for labourers. It does not seem to me necessary or advisable to pay persons to improve their cultivation. A number of the finest tanks have been made by the *thekadars* who had no proprietary rights, and were made in order to obtain a preferential claim to a continuance of their lease. A rise in the standard of comfort—in many cases excessive—has led to a diminution of improvements in many villages. I do not think that such proprietors will be weaned back to the path of economy if public funds are spent in subsidising them. The more Government spends on them, the less they are likely to spend on their own protection. The upkeep of tanks is as important as their construction. It is costly work. The man who is not prepared to pay the principal and very moderate interest on the cost of a tank will not be the man to keep it in repair. He will need a further loan or a Government grant for that purpose. His daughters will have expensive weddings.

I would make an exception in famine times because famine labour is often expensive and also because it is cheaper to pay half or often the whole of the cost of a *malguzar's* tank than to support by direct famine relief works the same number of labourers. But the concession should in my opinion only be given where Government relief-works are really obviated by it, due precautions being taken that the money is really

spent on the project, and that only such persons as would be admitted to relief-works are employed.

(3) As above, *vide* No. 2.

(4) No. In the case of tanks I do not think that Government will wisely remit the loan if the tank is a failure. That would put a premium on incompetence, negligence or fraud. In the case of wells, there is no urgent need to subsidise their construction, save for public use as a high road, etc. Well irrigation is dealt with later.

(5) Our method of collection is not elastic enough. It is difficult to make it more elastic, unless the Deputy Commissioner and his Tahsildars are allowed to stay long enough to know their districts and to be well acquainted with the debtors. Where such officials are new, collection is a mechanical matter, and pressure may be unduly applied causing much harm.

The terms of repayment should rarely be fixed in the first case at more than five years, since if instalments have still to be repaid at a time when the tank is beginning to be in need of repair, and unfavourable seasons have perhaps come, the difficulty of settling the debt becomes serious. The money which could have been repaid has not been saved to meet a rainless day, but spent on less necessary objects. The maximum periods of repayment allowed are ample for the kind of irrigation in question.

(6) Dealt with under No. 2.

6. (Clause 1).—No.

(Last sentence).—Yes.

Give me water at Government expense is the frequent petition. Government has made and improved a number of tanks by famine relief labour and charged nothing to the cultivators, who benefit; many of the malguzars whose tanks were not taken up, would like the same gratuitous benefits.

23. Q. One or more small nallas are "bunded" by a dam running more or less straight across their course. Sometimes a tank is supplied with water from a tank on higher ground. The water of the tank will usually dry or nearly dry up by the end of the hot weather, if the bund has not been cut to let out what is left after irrigation, so as to sow the bed.

The beds of tanks of yellow soil (*sehar*) are not sown, since that soil is not used for *rabi* crops. Sometimes enough water is left in such tanks for cattle and mankind to use throughout the hot weather; but the tank is almost always nearly, if not quite, empty by the end of May. It would not be able to provide for irrigation a second year if no rain fell first to fill it.

(2) The water is let off by *salangs* (overflow channels) at each side. It is also in a number of cases let out from *mohugas* (pipes of earthenware, stone or trunks of trees hollowed out). These are situated at various heights below high water-level.

Finally, except in the case of larger tanks, the bund is cut in one or more places to irrigate the best fields which are low down and contain the late ripening rice.

The malguzar takes much of the water for his transplantation if there is a long break in July—August. Tenants rarely get water for such a purpose. As regards the subsequent irrigation I quote from paragraph 67 of my Settlement Report on the Balaghat Tahsil:—

"Generally, however, the rainfall suffices for the needs of transplantation, and irrigation takes place only during the first break after the transplantation is finished. The malguzari takes each instalment of the water first, helping himself liberally to it. He then allows the tenants to divide among them a less ample allowance. At the first irrigation the water should fill the fields at least 6 inches deep. The second irrigation takes place about a fortnight afterwards, and 4 inches of water are required to stand in the fields if the watering is to be adequate. The inferior kinds of rice require no more irrigation. Rice of medium quality usually requires a third, and the best kinds of rice a fourth watering. If the October rainfall be adequate and well distributed, the third watering is rendered unnecessary, while a fall at one time of 3 or 4 inches of rain in late October or early November enable the fields to dispense with the fourth watering.

Tenants rarely get more than one or two allotments of water—not always full ones. Such allowance is not quite sufficient in normal years for the medium quality rice, and hence tenants' fields usually have a somewhat lower outturn than that of similar fields belonging to malguzars. In the rare years of serious deficiency in the rain, the difference is very marked. A large number of the tanks are the property of the malguzar, having been constructed by him in his *sir* fields. The

malguzar takes in almost all cases all of the water of those tanks and the lion's share of the water of the tanks that are the village property, and his home-farm gives an outturn considerably above the average of tenancy land recorded as irrigated.

(3) (a) In a year of ample rainfall the supply suffices for all the above irrigation, *i.e.*, up to November.

(b) If the rainfall is scanty at the beginning, the tanks do not fill in time to permit of a surplus for irrigation. More commonly, however, the rainfall is deficient so in the later months—September, October and November—and although the September watering may nearly suffice, the absence of the later rains leads to an increased demand and reduced supply at the end of September, with the result that only the fields low down in the slope below the tank get full water in October. In that case one may find a sixteen-anna crop in one or two of the best fields, while the crop some 20 feet higher up on both sides is an eight-anna one.

(c) In a year of drought there is still a good deal of rainfall; but most of it is absorbed by the ground before it can reach the tanks. Almost all of the tanks start each June empty and where, as in 1899, the rainfall is deficient throughout, hardly any of them fill sufficiently to permit of any irrigation at all.

The year 1896 was one of failure of the later rains only, and although, following as it did upon previous repeated bad years, it caused acute famines, still a large part of the irrigated rice was saved in villages with good tanks. In 1899, however, nearly all of the tanks remained dry and the rice perished in the seed-beds early in the season.

(4) About 25 acres. Varies from very little up to several hundred acres.

24. Q. (1) In yellow soil only one crop of rice is grown, however good the irrigation. In brown soil irrigation enables a second crop of pulse to be raised after rice. In black soil a second crop of pulse is usually raised. Irrigation improves its outturn.

(2) The later ripening and more valuable rice can usually be grown in place of lighter rice where irrigation is available.

(3) (a) Hardly any increase.

(b) An increase from a very poor to a fair crop in much of the area irrigated.

(c) No increase in most cases where the rainfall fails throughout, as most of the tanks remain empty.

25. Q. Irrigation is generally available to commence when needed; but it frequently fails to last long enough for all the fields, owing to the smallness of the tanks.

26. Q. Very rarely.

27. Q. (1) Twenty per cent. on the gross outturn, about three to four rupees an acre if the irrigation is adequate. One to two rupees if the irrigation is of the ordinary kind received by tenants.

(2) Perhaps nothing. Perhaps the whole value of a fair crop, say twenty to twenty-five rupees an acre. It depends entirely on the extent to which the irrigation is adequate.

28. Q. (1) Water-rate is rarely paid; when it is, Rs. 2 to Rs. 3 per *khandi* of 2½ acres is approximately the rate. This would be on the area actually irrigated.

(2) The difference in the rent-rate paid for unirrigated and irrigated land is approximately as follows:—

Poor.	Good.
12	½ Unirrigated.
½	2 Irrigated.

This rate would be calculated on the area irrigated at settlement.

(3) Taking the land revenue at 55 per cent. of the rental, Government would gain about 5 annas per acre if water was provided. This rate would be on the area irrigated at settlement. If the improvement was effected by the malguzar or tenant, there would be no gain to Government until the second settlement after it was effected.

29. Q. Landlords usually arrange for the repair of the tank outlets, etc., but not infrequently take help from their tenants. Each man prepares his own fields for irrigation, and does the small amount of work necessary to get the water to his fields.

30. Q. In a haphazard way, if the landlord is neglectful, some tenant who has fields which receive irrigation from the tank does what is needful to get his

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irrigation. No regular repairs are made in most cases; but after a number of years the land usually patches up the tank and perhaps digs some of the accumulated silt. No legislation seems advisable for such petty tanks. The system works well where the landlord is of fair intelligence and care. I cannot state an approximate cost per acre, as the cases vary so.

31. Q. Such cases rarely occur. Where they do, the owner of the tank arranges privately at what price to sell his water. Few tanks irrigate several villages. If large tanks irrigating a number of villages are constructed, this difficulty will arise.

32. Q. Yes. I would recommend liberal grants of advances at low interest to malguzars who are solvent and are prudent men likely to keep the tanks in repair, and to repay the principal punctually. For small projects five years should be long enough time for repayment. In the case of tanks costing several thousand rupees larger periods might be fixed.

33. Q. Tanks in black and brown soil silt up more rapidly than in yellow, especially if there is much cultivated land in the catchment area.

Can give no statistics. Silt is removed by digging up the bed on occasion; it may be a few years after the tank was built and it may be a long time after.

34. Q. Wells are practically only used for the irrigation of garden crops, which are grown usually near a nalla in what is called "kachcha" land. The wells are usually *kachcha* and are such in or near the bed of the nalla. They irrigate about an acre which is sown with onions, garlic, sugarcane, wheat and barley and miscellaneous vegetables.

Such wells are—

- (1) On an average 10 or 15 feet deep.
- (2) (a) Supplied by springs which last through the year and are not saline.
- (3) Cost from Rs. 5 to Rs. 20.
- (4) Last for the year.

The Seoni district consists of several plateaux separated from one another by belts of hill and jungle. To the north it includes also a small strip of rich flat land in the valley of the Nerbudda. To the east it comprises a long narrow strip of country bordering on the Wynganga, called the Ugli tract. To the south there is a block of jungly country below the ghat, called the Kurai tract. The rest is all plateau.

2. Excluding the 18 villages in the valley of the Nerbudda, where the cultivation is of rice and wheat in flat, embanked fields and is of so stable a description that both harvests were good in the recent years of drought, the district may be divided into three agricultural tracts:—

- (1) The rice country.
- (2) The open wheat country, and
- (3) The mixed crop country, which comprises all of the villages not falling into the first two classes. Most of the villages in this class lie on the ranges of the low hills which fringe and in some cases cut through the wheat tract.

3. The open wheat country includes the Haveli and the Ghansor pargana in the Seoni tahsil and the more level portions of the Lakhnadon tahsil. It suffered greatly from the rust which prevailed in 1894 and 1895, but it has never suffered seriously from drought. The wheat crop was a very fair one in 1900 the year of greatest monsoon failure on record. Along parts of the course of the Wynganga and Bijna, in the south of the Lakhnadon tahsil, there are a number of villages in which cotton and *til* are important crops. These benefited similarly in 1900 to those which specialised in wheat. They may here be included as part of the wheat country.

As regards this tract the irrigation question may be summed up as follows:—Save for cotton and *til* which do well with a light rainfall, the kharif crops are quite unimportant. Wheat is by far the most important rabi crop. It suffers from excess of moisture more frequently and more severely than from a deficiency of it. Should preparations for irrigation of rabi crops be made, the irrigation facilities will very rarely be used. Many villages had an average wheat crop in our year of the greatest drought. Tanks, which would hardly, if ever, be used, and would almost certainly be empty or nearly so by October—November if in any year they were required, cannot be taken as the basis of a protective scheme.

(5) The water is raised by bund with a lift or by a leather mote with bullocks.

(6 & 7) Irrigate about an acre out of the 2 or 3 acres of garden attached, the rest being fallow or sown with field crops.

Apart from the above, there are in ordinary years wells which might be used for irrigation, and others can be dug in famine. In practice they are not much used for irrigation in normal times or in famine. The reason is as follows.

Kachcha wells can be dug in yellow rice land for Rs. 20 to Rs. 50; but in an ordinary year they would not pay for the irrigation of rice, as the area they would irrigate is small, and in famine time they would contain little water and only save a minute fraction of the crops at heavy expense.

In the black soil wells are expensive. They have to be lined, and cost from Rs. 300 to Rs. 800. The water is met with very deep, at perhaps 40 to 50 feet. Frequently, after considerable outlay, the wells fail to contain more than a mere trickle of water, especially in the rocky northern half of the district.

35, 36 and 37. Qs. The area under well irrigation is so small and unimportant (save for the growth of vegetables) that I do not answer these questions.

38. Q. (1) Yes.

(2) Yes, except in the case of wells sunk (mainly by Marars) on the borders or in the beds of nallas.

Clause 2. Not that I am aware of. The Local Board, Lakhnadon, has found a considerable difficulty in sinking successful wells for the use of the travellers, on account of the nature of the rocky soil.

I have no expert experience in such matters.

39. Q. No.

40. Q. Dealt with under Question 34.

I had a number of wells dug for water-supply for famine relief-works, etc. In the beds of sandy streams it is easy to find water; but it would be of no use from the point of view of irrigation of fields higher up and at a distance.

Wells in this district are expensive to make, run rapidly dry and, on account of inaptitude of the people for the working of them, would prove too costly a means of saving such portion of the rabi crop as they could save. Several malguzars have tried them in vain. By the time the rabi crops show signs of failure from drought, the rich black soil is so split up that the water percolates through the cracks and benefits only a minute fraction of the crop. [Some doubt has been expressed as to the practicability of irrigating black cotton soil. I may mention therefore that it is used for irrigated rice in the Balaghat district. In Seoni it hardly occurs in the rice tract. There is a good deal of "morand" mostly of light quality, but hardly any "kali" soil there.]

4. The best of the villages in the mixed crop country did not suffer seriously from drought in 1897 or in 1900, but speaking generally, the proper and more stony the soil, the greater was the crop failure, and in many villages of this class the drought caused serious loss. The variety of cropping prevented total failure of every crop, but the damage done was of sufficient magnitude to necessitate large remissions of revenue and some expenditure on famine relief. The broken and hilly nature of these villages renders extremely difficult any scheme of famine protection by irrigation. Tanks would irrigate only small areas and would mostly be dry or nearly so by the time their water was needed. Wells would be very expensive in such rocky soil and with such a low level of sub-soil water. The crops grown are such as do not ordinarily need irrigation and if in a famine year irrigation is resorted to, the cost is likely to exceed the value of the small portion of the crops that can be saved.

5. But with the rice tract it is quite otherwise. The prevailing cultivation is rice, transplanted and wherever possible, irrigated. Where the fields are of pure sehar (a soft yellow soil), nothing but such rice is grown. It is the existence of large area of this soil that necessitates there being a rice tract, and the residence in the area of castes which have had perforce to become experts in rice cultivation has led to a good deal of land being used primarily for rice which can grow other crops and which in other parts of the district would do so. Where there is some brownness or blackness in the soil and it is more retentive of moisture, a second crop of pulses or of wheat is grown. But in a famine year rabi crops do not survive the drought here as they do in the open wheat country. The soil of the rice tract as a whole is far less retentive of moisture than that of the rich wheat

tracts. The rabi crops are of secondary importance and tend to give the least assistance in the years when the rice fails from drought. So that in this tract irrigation is of primary importance. It is very ineffective in years of drought, for there have been two recent famines caused by widespread failure of the rice crop, the latter of them being practically total failure over the whole of the rice area. And if this ineffectiveness can be remedied, there is a hope that in ordinary years as well as in years of drought the benefit of the extra water will be utilised and some return will be obtained for the expenditure. It is noticeable that far from irrigation being a protection against famine, the unirrigated wheat tract is far better protected by the nature of its cropping than the rice tract is or can be, for much of the rice country either cannot be irrigated or can only be so poorly irrigated that the crop totally fails in a year of real drought. At the same time it would be idle to suggest a change of cropping as a protective measure for this tract. The genius of the people is for rice growing. It is so because in much of the soil they can grow no other crop. Agricultural discoveries may enable some more stable crop to be substituted, but meanwhile the tract must grow rice and in many parts rice alone. On account of its far greater measure of need and far greater scope for our efforts the rice tract must monopolise our present efforts to improve irrigation.

6. The question of the kind of irrigation is simple. Canals are impracticable in so undulating country; wells exist but have proved of little use in time of famine. They run dry rapidly and the ineffectiveness of the labour and consequent expense of well irrigation have prevented their being appreciably utilised in the past and will continue to do so in the near future. Professional gardeners, Marars and Malis, sink wells in or near the beds of nallas, and irrigate their crops of vegetables. But the demand for such produce, the supply of the suitable 'kachchar' land and the number of men of the castes which have a taste for that particular work are limited, and the salvation of the tract from famine cannot be hoped for from an extension of market gardening.

7. Tanks then afford the only means of protecting the rice tract from drought. To show how far they can afford such protection I proceed to describe briefly the nature of the country. The rice area may be said to consist of the Barghat, Ugli and Kurai tracts all in the Seoni tahsil. By the Barghat tract I indicate not merely the Barghat pargana but the whole of the Seoni plateau which is given over to rice. It consists of a strip of country only two or three miles wide at the north and some 20 miles wide at the south with scattered patches running even farther to the south-west. It lies mostly between two ranges of hills and is crossed by streams running from the western range (the Amagurh and Bhondwa ghats) to the eastern (Ugli) range. The streams run generally north-eastwards and after cutting through the Ugli hills and the Ugli tract below meet the Wynganga. The Barghat plateau is some couple of hundred feet below the Seoni Haveli, the main (wheat tract) plateau. It does not receive the drainage from it, but its streams, the Hirri river and its tributaries, carry away almost all of the rain falling on the rugged belt of hills separating the two plateaux.

8. The Ugli valley, several hundred feet lower than Barghat, is on the whole less undulating. Its drainage is from the western hills due east to the Wynganga. Most of the rapid streams that cut through it have only 6 or 8 miles of their course left before they meet the Ganga. It is thus cut up into half a dozen small blocks which can only be irrigated by separate arrangements, from west to east.

The Kurai tract consists of a bay running into the hills and like the Ugli valley is several hundred feet below the Seoni plateau. It is watered by the Bawanthari and its numerous tributaries which run south-eastwards through it into the Bhandara district. Its soil is more undulating than the rest of the rice tract. It contains much jungle and is more backwards. Irrigation is less likely to be profitable here, because the steepness of the slopes reduces the area that can be irrigated from each tank, and there is more miscellaneous cropping so that (save for a small block of purely rice villages near Piparwani) a failure of the rains is followed by somewhat less distress. I am leaving the Kurai tract out of account in this note. If experiments are to be made it is advisable that they should be in the easier and more profitable fields afforded by the Barghat plateau and the Ugli valley.

9. The first point to notice in connection with the rice area is that no attempt has yet been made to dam the main streams. In a year of drought considerable volumes of water run to waste. The beds of these streams are from 30 to 60 feet below the level of the

fields on either side. The streams are mostly dry or nearly so by the time that the rice crops need irrigation, and if they contain any water, the expense of lifting it on to even the nearest portions of the fields is prohibitive. Further, no tanks can be made by damming big streams in the open rice country, for the water thus collected would submerge large areas of the lowest-lying and most productive fields, which are in many cases already irrigated from small tanks. So that if large tanks are to be made, the sites must be close to the exit of the streams from the western hills. In some cases the streams have not sufficient volume by them, in still more cases the broken nature of the ground between such sites and the open more level rice country renders the construction of such tanks impracticable, but there are unquestionably a few sites in which tanks can be made which will irrigate large areas in ordinary times and will give some protection in a year of drought as extreme as 1899.

10. While the only protection that can be afforded against such a drought is to be obtained by the construction of large tanks on the principal streams of the tract, much protection against minor failure in the amount or distribution of the rainfall can be, and has in the past been, afforded by the damming of the smaller nallas. Generally speaking, wherever the person who paid the cost was to get the bulk of the benefit, the streams which run from up to half a mile have been dammed in cases where the doing so would not submerge much valuable land. Most of the village tanks irrigate primarily the malguzar's home farm. Few tanks have been made in one village to irrigate another and where, as is often the case, a nalla forms the boundary between two villages and concerted action has been necessary for bunding it, such action has frequently not been taken. Apart from the nallas which could irrigate mainly tenants' land and which no one of the persons interested is able to afford the expense of damming, and apart from the nallas which if bunded will benefit several villages too disunited hitherto to join in executing the work however necessary, there are a number of sites where tanks have been made but have fallen out of repair. Sometimes the tank has burst soon after construction, having been built of insufficient strength but more often an enterprising tank builder has been succeeded by negligent heirs, and failure to execute repairs for many years has caused the tank to become either quite useless or only partially serviceable. Encroachments on the bed of the tank have ended by becoming recognised as occupancy rights of cultivation, and no attempt is likely to be now made to restore the tank to its former state of utility. But despite the scores of cases of failure to effect perfectly feasible improvements or to keep them in working order, much protection is given in ordinary years by the existing tanks. And in the first famine year (1896) a considerable portion of the crop in the low-lying fields was saved. The famine was due to failure of the late rains only. It was acute because the failure of the unirrigated kharif crops and of a part of the normally-irrigated rice, came at a time when previous repeated bad harvests had exhausted the resources of the people. But ordinarily the tanks, petty and shallow though they are, afford protection to a sufficient area of the rice land to render real famine highly unlikely except in the event of a failure of the monsoon throughout, such as occurred in 1899. Improvements in, and an extension of, the existing system of small tanks will therefore not merely greatly increase the productive capacity of the land in normal years but also afford a fair degree of protection from famine in the case of only partial failure of the monsoon, such a failure being more common than a total one.

11. The difficulties to be encountered in a system of famine protection by the construction of irrigation works on the main streams, differ widely from those met with in a scheme for extending irrigation by an increase in the number and improvement in the efficiency of the small tanks. In the former case the main difficulty is to find a suitable site. If a sufficient number of large tanks, each costing, say, half a lakh of rupees or more, can be made in suitable localities, situated near enough to one another for control by the requisite superior staff, no further difficulties, save perhaps legislation regarding a water-rate, should arise. But in the case of the petty village tanks we are confronted by a serious difficulty. The sites are numerous but the systematic development of the petty irrigation resources of the country is a task beyond our power and likely for some time to continue so. The great extension of credit which followed the 30 years' settlement has led to the extensive indebtedness of the cultivating classes. The repeated bad seasons have proved disastrous to many who owed large sums at high interest. Few malguzars are willing to spend much on tanks and there is no keenness to take *takavi* loans for the purpose. In almost every village either

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Mr. A. Mayne. 17 Mar. 02. malguzars or tenants desire that Government should make or improve tanks. In hardly any are they willing to make or improve them themselves. A number of useful tanks have been made as relief works during the recent famines and handed over gratuitously to the people, and the cultivators hope for and wait for others to be made. They offer to pay a water-rate, but there is no likelihood of many of the hundreds of promising projects being executed by the people themselves even with the help of Government advances. It is open to Government to increase the protection from small tanks by making and improving a number of others, but I am convinced that the next step to Government being expected to make the tanks will be that they are required to look after them. Now in small tanks the annual repairs during, or the thorough repairs after, a period of a few years, cost a sum which often bears a high percentage to the primary cost of the tank. A nalla may be dammed for Rs. 500, which will irrigate 50 acres or more, but within another 10 years a further 500 rupees may have to be spent to prevent the tank being ruined or to repair it after a sudden heavy storm has breached it, making a new nalla perhaps deeper and more difficult to dam than the old one. The people on the whole are improvident and the tenants who hold more than three-quarters of the total occupied area are specially so. What is everybody's business is no body's business. There can be little doubt that in the absence of a very efficient system of inspection and control, the hundreds of additional tanks* which Government would have to construct if they decided to develop the irrigation thoroughly would deteriorate far more rapidly than do the tanks built by malguzars for the benefit mainly of their home farms. Such a system of control may develop in the rather distant future, or the people may later on with the help of *takavi* loans be willing to themselves improve the number and efficiency of their small tanks, but in the meantime it appears to me that no marked improvement at an early date in the protection afforded by the small tanks can be expected unless Government are prepared to construct, improve and to some extent control the use of hundreds of village tanks, costing each from a few score to several thousand rupees, scattered over one-quarter of the district and many of them already subject to various rights and disputes. This would seem altogether beyond the scope of Government. Information is being collected as to the improvements which are desirable in each village. Should famine recur, some of these can be suitably effected. It is also possible that improved methods of construction of tanks and of provision of sluices can be found by enquiring in other provinces. Apart from such partial improvements I can only express the hope that in spite of the rather demoralising effect of a gratuitous construction and repair of some scores of tanks, the people may become more provident and arrange to protect much of their best land, as they could without serious hardship in a few years do against partial failures of the monsoon.

12. In regard to the large tanks, however, it is certain that the people have neither the skill, the capital nor the capacity for combination, which the construction of these by the villages to be benefited would postulate. If the work is properly carried out these tanks will give protection even in a year such as 1899, though in a limited area. Still if sites can be found, a score, or even a dozen, of such tanks will in a year of severe drought, by forming as many cases in the desert of the famine-stricken area, go far to mitigate the severity of the distress, and by supplying seed for the following year will give the rice tract as a whole far more recuperative capacity than it has shown after the last failure of the monsoon. A commencement of such a scheme for famine protection by large tanks has been made during this cold weather by the Public Works Department and a list of 7 projects was sent to me to report on. My enquiries have led me to the conclusion that 5 of the tanks are certain to fail in being protective works in a year of drought such as 1899. Correspondence with the Public Works Department showed that, on account of the absence of more trustworthy information, the calculations were based on data which were not drawn from, and in some cases could not possibly apply to, this district. It is needless to refer here in detail to the proposals, which have, I understand, been dropped. The Engineers engaged in making the enquiries have received little assistance from the Land Revenue Branch, the only department which can have any claims to expert knowledge on the subject. My *locum tenens* gave what information he could, but he was new to the district and to the subject of the enquiries. Having been Settlement Officer of the adjoining and similar dis-

trict, Balaghat, and having made extensive local enquiries in Seoni, I proceed to give such data as I have been able to collect, and to suggest the lines of enquiry which appear to me to promise to be fruitful in sound results.

13. To arrive at a correct estimate of the amount of water which may be expected to flow into any of our proposed tanks, it is first of all necessary to ascertain with fair accuracy the catchment area. In the case of nallas, having a drainage area of 8 or 10 miles, this may perhaps, at any rate for the earlier stage of the work, be calculated from our one-inch maps. Where, however, the tanks are to be filled by the drainage of two or three miles or less, I would suggest that the error that can be thus introduced is too large and it would be preferable to plot the watershed roughly on the patwari's 16-inch map. I found this precaution necessary from the local examination of a proposed tank with a reported catchment area of 1.33 square miles.

14. An even more important preliminary step in the enquiries is to determine what rate of run-off of the rainfall may be expected in normal years and what in a year of drought. So far as I know, the only course hitherto followed has been the wholesale adoption of Binnie's tables for the whole province. These give 40 per cent. of the rainfall as the yield of the catchment area in normal years, our average rainfall at Seoni during the wet months being 48.96 inches. They give 19 per cent. on a rainfall of 22.91—our figure for years of extreme drought. But the catchment areas under consideration differ considerably in kind. Some of the nallas to be dammed are mountain torrents rushing rapidly down from ranges of steep hills, four or five hundred feet above the proposed site. Others take their rise below the ghats and run over relatively level and in parts cultivated ground. There appears to be no *prima facie* probability of a figure of 40 per cent. proving a suitable basis for all of the projects. It may indeed be found unsuitable for any of them, as it has, I believe, been arrived at from data obtained from other, possibly very different, country. In any case it would appear to be inexpedient, if it can be avoided, to adopt such a figure of 40 per cent. for even a rough average basis of calculation, since a variation of 10 per cent. either way, say to 30 per cent. or to 50 per cent., may make all the difference between a project being doomed to failure and it being a fine, protective work; for by a very simple method of enquiry we can obtain a basis suited to our local conditions. All that is necessary is to select a few sample tanks, the catchment areas of which are as nearly as possible typical of those of the tanks we are proposing to build. These catchment areas should be surveyed and the capacities of the tanks at different depths ascertained. A statement would then be drawn up shewing the volumes of water which collect in the tanks on various dates during next rains. A comparison of this statement with the rainfall statistics of the period will give the true run-off for each catchment area.

For past years the only local records we have are of the Babaria reservoir. Its catchment area is partly jungle with light soil and partly cultivated rabi land with a gentle slope. The fall though fairly steep is considerably less than will be the case with some of our proposed large tanks. The catchment area and capacity at various depths are known. The Sub-Divisional Officer has at my suggestion made enquiries on the lines specified above. They show that the run-off last year was 57 per cent. and this year 42 per cent. The considerably higher figure for last year was due to a period of steady rain during which 8.41 inches fell within five consecutive days. This year's rainfall was more evenly distributed. I am having the enquiry extended to several others of the past years, with a view to see how far such periods of concentrated rainfall tend to recur and what run-off can reasonably be taken as an average to be expected.

While our other tanks are almost all small and have mostly catchment areas much more level than those of the tanks which it is proposed to construct, and their percentages of run-off will be lower than we may expect for the latter, the enquiry into the cases of some selected small tanks will provide invaluable data for the comparison between the run-offs from soil of varying kind and during periods of varying distribution of rainfall. With the experience thus gained and the figures for the Babaria reservoir for a series of years, we shall be in a position to state with more confidence what run-off we may expect for our new tanks. I trust that in the case of such works as Rupal it will not be found to be less than 50 per cent. If that be so, the prospects of our scheme of famine protection will be greatly improved.

* At Manegaon and Mandi two of the fine tanks built in the last famine are already nearly ruined, because the malguzars and tenants have failed to execute repairs which, if carried out in time, would have cost little.

It is desirable also that more accurate statistics of rainfall for the rice tract should be obtained by the establishment of rain-gauges there. Local opinion has it that the rainfall in both Barghat, Ugli and Kurai is lighter than on the main Seoni plateau where the rain-gauge is situated.

15. The next point upon which there is at present the greatest uncertainty is the duty of water. My *locum tenens* estimated the duty at 1½ feet for this district but expressed considerable doubt on the point. Mr. Hutton took for Bhandara 2 feet for normal years and 4 feet for a year of famine. Mr. Harriott has roughly estimated for Seoni 5 inches for normal years and 2 feet for famine, but asks that further enquiries be made. As Settlement Officer I made extensive enquiries in Balaghat and arrived at 10 inches for inferior rice and 14 to 18 inches for better rice, apart from the water sometimes required for transplantation. On the depth taken will depend the area which we can reckon to irrigate, so that accuracy is of great importance.

It appears necessary that the figures adopted should, as in Bhandara, include all loss occurring in the distribution channels and from evaporation during the irrigation months. The estimate I made as Settlement Officer did not include this. It shewed what the rice plants received, not what the tank lost.

I am disposed to think that Mr. Hutton's figure will be found to be a little above the mark. My present enquiries for four Seoni tanks give an average of 14 inches, but the irrigation being only to fields near the tanks, the allowance for waste in distribution has been assumed at a low figure. The matter need not be left in doubt after this monsoon. All that is necessary is for a careful observer to spend a few weeks during August, September and October in studying the irrigation actually supplied from some selected tanks. The depth of each watering should be measured in a number of cases and the average for the tank adopted. The earlier and later, the malguzar's and the tenants', waterings frequently differ in depth. They can be classed accordingly. The list for each tank will show the fields watered once, twice, thrice, etc., and separate figures of the areas for which water is taken for transplantation. The average depth received per acre can thus be calculated with fair accuracy. To ascertain the loss to the tank it will be necessary to make allowance for waste and loss in distribution. This will have to be roughly estimated according to the distance and positions of the fields. The results can then be compared with the loss of water from the tank, calculated by actual measurement of its depth and water-spread area at the different heights. The difference between the volume of water in the tank at the commencement of the monsoon and its total capacity must not be taken to represent the amount used for irrigation, for many tanks fill up partly or completely from the later rain after irrigation from them has commenced. Allowance must be made for this, all appreciable receipts of water after the tank has once been filled being noted separately. Otherwise some of the tanks will appear to irrigate impossibly large areas.

The same tanks can conveniently be taken for these experiments as are used for obtaining data regarding the run-off. They should be such that there is ordinarily no less by overflowing. I give in Appendix I the result of four local enquiries I have had made last month. The depth of duty was calculated by measuring in a number of cases the depth reported to have been received and striking an average. Monsoon enquiries will avoid such inaccuracies as may in these cases have occurred.

In regard to the duty for a year of severe drought, such experiments will, I trust, not be practicable for a long time. It is useless trying to calculate the duty by an enquiry into the reduction which took place in the areas actually irrigated during last famine year, for most of the tanks were quite dry. But we can form a rough estimate of the probable duty after consideration of the extra evaporation during the time of irrigation and of the extra depth of irrigation required to supplement a deficiency of upward of 26 inches of rainfall. The construction of large tanks will lead to much of the lighter rice, now receiving little or no irrigation, being replaced by rice of medium quality, if not the best rice, so that while in a normal year 1½ feet may be found to be a fair average for the duty, it is likely that 3 if not 4 feet will be needed to produce a good crop in a time of severe drought. In years of failure of only the late monsoon, a smaller duty will doubtless suffice.

16. In making our calculations as to the quantity of water required, we have to consider the needs of transplanted rice only, for, as is shown by the figures in Appendix II, all irrigated rice is transplanted, save in the year or two immediately succeeding a famine.

Lack of seed and capital then leads to a small and quite ephemeral extension of broadcast cultivation to irrigated land.

Further, we have to allow for the normal irrigation being required every year. It would appear to be highly dangerous to assume that since 1898 was a year of fairly good rainfall, the monsoon in the year preceding the next year of drought will be such that little irrigation is required. As a matter of fact, a larger area was irrigated in 1898 than in any year since 1895. A still larger area would have been irrigated but that much land below some of the tanks became fallow or waste at the first famine and has not yet been brought back into its former state of cultivation. Either the tanks are broken or the cultivator is too poor to sow the land. So that to whatever area we are going to supply water, we must allow for the normal supply in the year before failure of the monsoon, and calculate our water available in the year of drought by deducting from the balance thus obtained the loss due to six feet of evaporation, and adding to the remainder the yield of the catchment area for the monsoon months of the year of drought.

17. This raises the question whether the tanks should be run on commercial principles or as purely protective works, that is, whether it will be advisable in normal years to supply water to a larger area or only to the area that can be effectively protected from drought in a year of the failure of the monsoon. Although we have not yet got the accurate figures regarding the yield and the duty which we shall shortly have, it is already clear that the yield of water will be largely reduced in most tanks and the duty per acre will always be largely increased in a year of drought. So that the area that can be completely protected must be much smaller than the area which can be protected against partial failure of the monsoon. As it is necessary that some decision as to the system to be adopted be arrived at before the projects are sent up for sanction, I may mention here that some of the tanks proposed are so shallow that if not used in any year for irrigation, most of the water will dry up before the next monsoon. Such tanks cannot by any possibility be treated as protective unless they can be deepened and their water-spread area be reduced as compared with their capacity. I quote three as samples of shallow tanks:—

NAME OF TANK.	Ara rda.	Gudma.	Bori.
Capacity of full tank available for irrigation, (i.e., above sluice level).	43·65	39·95	37·64
Deduct 6 feet loss by evaporation.	31·44	27·18	26·64
Balance at commencement of year of drought.	12·21	12·77	11·00
Add yield of catchment area in year of drought.	12·39	10·87	9·67
Total water available for irrigation in year of drought.	24·60	23·64	20·67

It will be noticed that if the tank is not used at all, evaporation during a single cold and hot weather dries up 72, 68, and 71 per cent. of the available water of Arandia 59 per cent. these tanks, and that the Gudma 56 per cent. water available in a year of Bori 54 per cent. drought on the supposition that no irrigation at all was given the previous year, is in any case only slightly over half of the normal supply.

18. In more favourable sites, as at Rumal, the tanks will afford substantial protection in a year of drought as severe as the worst on record; but even in such cases it appears very doubtful whether the small increase in the area to be absolutely protected is sufficiently large to justify the great sacrifice of revenue which must be made, if the area to be irrigated in normal years is kept down to the much smaller area which can be protected even in a year of extreme drought. The thirsty fields require water practically every year. The people are prepared to pay for the water. If the water is not used year by year, much of it will dry up. The income will be so reduced that instead of being paying investments the tanks are likely to cause heavy loss, to fail to pay interest, to repay capital or even in some cases to pay for the necessary maintenance charges.

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19. I turn now to the payments which are likely to accrue for the water supplied. I have heard it suggested that the people will pay Rs. 2 per acre for water, if assured of its being supplied even in a year of drought, and that eight annas an acre of this sum would suffice for the up-keep and supervision of the tank supplying the water. Now it is likely that in this district cultivators will pay for water Rs. 2 per acre or even larger sums in a year of partial or severe drought, but I fear that there is no hope at all of such rates being paid regularly year by year, however perfect the protection offered against famine. The people are not provident. Rents are low. In some parts of India the native is willing to insure against fire or death. This district is too backward for such prudent ideas to have any chance of success. For insurance against the possibly remote contingency of a year of severe drought, the cultivator will pay little or nothing in excess of what he will pay to have water every ordinary year, that is little above the rate which he pays for irrigation from his village tank in the case of land so situated that he can get such irrigation in sufficient quantity in all ordinary years. I give in Appendix III a summary of the rent rates adopted at Settlement for the Kurai, Barghat and Ugli groups. It shows that the irrigated land of the first class pays eleven annas and that of the second class about seven annas per acre heavier rent than does equally good land level but unirrigated. Much of the land which our proposed tanks will irrigate is of lighter soil and steeper slope than the already irrigated land, and the average extra rent for the land to be irrigated would not exceed nine annas an acre if it were not that the water-supply will be more abundant than that provided by village tanks. Making allowances for the better supply of water perhaps ten or twelve annas an acre of extra rent would be paid for such facilities.

To ascertain the opinion of the people themselves I have made enquiries in many villages in the rice tract as to the rate the people are prepared to pay for an abundant water-supply, and the answers have varied from one rupee to three rupees per khandi of 2½ acres. Rarely has more than two rupees a khandi (13 annas an acre) been offered. Some of the cultivators have qualified their offers by stating that they would pay the increased rate of rent after two or three years if fair harvests have enabled them to clear off their debts and get back their land into proper cultivation. The present irrigation even of the first class is frequently inadequate, and the provision of the adequate and constant water would lead to a steady development in the villages thus benefited. This and the opening up of the district by the Satpura Railway should cause an enhancement of rents in the tracts improved by our large tanks. So that in a few years we might hope that one rupee an acre of water rate or extra rent would be realisable. Of this, if taken as rent, about 8 annas per acre would be the extra revenue accruing to Government. If a separate water-rate were levied, a larger portion of the 16 annas might be realised by the State. It will be necessary then to consider the projects in the light of the fact that a water-rate ten or twelve annas an acre can on the average be realised at first and probably one rupee an acre after a few years. The sums are so small that few if any of the tanks will be paying investments, unless they are constructed and supervised cheaply and used to irrigate almost the maximum area possible each year.

20. I have described the kind of irrigation which can be undertaken with advantage by Government, have explained the extent and deficiencies of our present data, and have indicated the lines upon which a more trustworthy basis for irrigation schemes can soon be arrived at. I proceed to offer some suggestions as to the organization which appears to be necessary, or at least very desirable, if our irrigation enquiries are to result in an adequate number of sound projects. The first point to which I beg to invite attention is the necessity of effective co-operation between the Public Works Department and the Revenue Department. Save in the matter of the preparation of plan and estimate for building the tank and of calculations regarding yield of water, the difficulties to be met with primarily concern the Revenue Department. A regular irrigation department might acquire in time the local knowledge of cultivation necessary before any opinion of value can be expressed as to the merits of the proposed tanks, but the branch of the Public Works Department would be so small that there appears reason to apprehend that a good deal of the work would necessarily have to be done by men who as District Engineers or Sub-Divisional Officers were not specialists in irrigation and did not possess the necessary knowledge of local conditions of agriculture. At any rate for the present it would seem

desirable that the proposals should be subjected stage by stage to a close scrutiny by the Revenue Department. Unfortunately a considerable number of Deputy Commissioners have had no opportunity of obtaining a close acquaintance with irrigation or with the cultivation of rice as it is carried on in Bhandara, Balaghat and Seoni. As the personal equation counts for so much in a new departure, it would appear to be of primary importance that, unless a separate Civil Officer is appointed, the districts for which important irrigation proposals are to be prepared should be held for some years by Deputy Commissioners who possess the requisite knowledge. Now that the opening of the Satpura plateau by the railway is to so greatly reduce distances, it might be found desirable to restore to Seoni and Bhandara the portions which were taken away to form Balaghat and thereby to reduce the difficulty of obtaining Deputy Commissioners with the required qualifications. It would be necessary to give each of the Deputy Commissioners an experienced Assistant Commissioner to relieve them of much of the pressure of current routine work, but if some such arrangements were made, splendid results might be confidently expected. From my detailed inspection as Settlement Officer I know that a large part of the Balaghat district offers opportunities at least as great as Seoni does. As regard the subordinate staff an intelligent Revenue Inspector of the rice tract can soon be trained sufficiently to enable him to give valuable assistance. If enquiries such as are suggested in paragraphs 13 and 14 are to be undertaken during next year's rains, a trained Revenue Inspector might well be deputed in conjunction with a Public Works Department Overseer to make the preliminary enquiries in the hot weather into the catchment areas, the depth and the waterspread area at various levels of the tanks which are to be the subject of the experiments.

Each important stream should be inspected systematically. There are many such, down which run to waste in years of drought enough water to irrigate thousands of acres. If the Hirri river could be dammed where it issues from the hilly country to cross the open Barghat plateau, it should irrigate some 20,000 acres. I am making enquiries with the help of the Sub-Divisional Officer. A site has not yet been found, but I have had prepared a project in stage I for damming one of the three main tributaries. This tank should be a deep one and therefore more protective than most. In normal years it should irrigate upwards of 3,400 acres. If kept unused, its loss by evaporation should be under 8 per cent., while under similar conditions even the final Rimal tank would lose 33 per cent. of its water.

Apart from the stream to stream inspection which will show us where we can make tanks of varying degrees of protectiveness much remains to be done in the matter of surveying the various ridges along which it is desirable to convey water from our tanks. Our village tanks are generally built with the object of irrigating the home farm only, lie below much of the cultivation and are frequently not suitable methods of conveying the water from our large tanks to the fields. Where large tanks are to be constructed, some of the existing small ones might well be turned into rich rice fields. It is desirable that the projects should be accompanied by proposals for the main channels along which the water is to be taken the heights of the ridges being marked on the map. In some cases the villagers complain that the tanks proposed will only give them irrigation when quite full, and in the absence of information as to the respective levels, it is difficult to form an opinion as to the reasonableness of the objections. Hence I am not fully satisfied as to the accuracy of the statistics which I have collected about the extent of irrigable land below each of the seven projected tanks. I submit the information, however, as illustrating the scope for improvements in cultivation in the event of suitable sites being found.

APPENDICES.

- I. Calculation of duty of actual irrigation from four tanks.
- II. Details of irrigation for eight years.
- III. Details of rates paid for present irrigation.
- IV. Some details regarding effect on cultivation of the seven tanks proposed (in stage II) by the Public Works Department.

APPENDIX I.

Statement showing result of local enquiry into the duty of Irrigation from the four tanks improved by the Public Works Department during the Famine of 1899-1900.

DETAILS OF AREA IRRIGATED.																	
Serial Number.	Name of village in which the tank is situated.	3 WATERINGS.				2 WATERINGS.				1 WATERING.				Total area irrigated.	Total amount of water used in cubic feet.	Average number of cubic feet per acre.	Depth of duty in inches.
		Area in acres.	Area in square feet.	Depth of 3 waterings.	Amount of water used in cubic feet.	Area in acres.	Area in square feet.	Depth of 2 waterings.	Amount of water used in cubic feet.	Area in acres.	Area in square feet.	Depth of 1 watering.	Amount of water used in cubic feet.				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Nayagaon (B Tank)	29.05	1,265,418	(a) 1½	2,003,578	...	...	...	...	6.94	302,506	(d) ¾	201,537	35.99	2,205,115	61,270	17
2	Barghat (A Tank)	13.54	589,802	(a) 1½	933,853	25.50	1,110,780	(b) 1½	1,295,910	67.00	2,918,520	(c) ¾	2,188,890	106.04	4,418,653	41,670	11½
3	Mundapur	7.45	324,522	(a) 1½	513,826	60	26,136	(b) 1½	30,492	3.36	146,361	(c) ¾	109,771	11.41	654,089	57,326	16
4	Khoont	...	...	...	...	51.52	2,244,211	(b) 1½	2,618,246	12.40	540,144	(c) ¾	405,103	63.92	3,023,354	47,209	13
TOTAL		50.04	2,179,742	(a) 1½	3,451,257	77.62	3,381,127	11	2,044,848	80.70	8,005,023	...	...	...	...	...	...

(a) Average duty by measurement of the depth to which the cultivators stated the water had risen 18 inches. Allowance for waste 1 inch.
 (b) Ditto
 (c) Ditto
 (d) Ditto
 (e) Ditto
 (f) Ditto
 (g) Ditto
 (h) Ditto
 (i) Ditto
 (j) Ditto
 (k) Ditto
 (l) Ditto
 (m) Ditto
 (n) Ditto
 (o) Ditto
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Note.—The allowance for waste and evaporation in distribution was estimated roughly according to the distance of the field watered.

APPENDIX II.

Details of irrigation in Seoni District from 1893-94 to 1900-1901.

FIGURES AS PER NEW SETTLEMENT REPORT.													FIGURES AS PER ANNUAL REVENUE REPORTS.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
Year.	Irrigable area according to soil and positions under head rice land.			Area irrigated from			Rice including transplanted and broadcasted.			Number of irrigation wells.			Area irrigated from tanks.			Area irrigated from other sources.			Total area irrigated.			Rice transplan- ted.			Rice broadcast- ed.			Irrigated crops wheat.						Irrigated crops rabi.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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																																						Tanks.	Other wells.	Total.	Irrigated.	Unirrigated.	Total.	Durable.	Temporary.	Total.	Irrigated.	Unirrigated.	Total.	Irrigated.	Unirrigated.	Total.	Total area irrigated under rice transplanted and broadcasted both.	Garden crops.	Miscellaneous food crops.	Miscellaneous non-food crops.	Tobacco.	Melons.	Garden crops.	Miscellaneous food crops.	Miscellaneous non-food crops.	Wheat.	Wheat grain.	Barley.	Condiments and spices.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
1884-85	729	388	1,116	532	995	36,709	893	27,127	28,778	63,763	69,547	...	14,434	14,434	25,79	47	33	19	15	10	13	296	115

* In this figure embanked fields (Bandhavs, Gathavs and Bosis) appear to have been included as tanks in cases where irrigation is effected from them.
 † Includes much irrigation from embanked fields which have not been entered as tanks save apparently in 1894-95.

APPENDIX III.
Statement showing the rents of various kinds of rice land in three Groups.

NAME OF GROUP.	MORABD I.			MORABD II.			MUCHABRA.			SABRA.			ALL-ROUND RATE FOR THE GROUP.				
	Rent rate for Saman land.	Excess rate of rent for land classed as irrigated No. II above Saman land.	Excess rate of rent for land classed as irrigated No. I above Saman land.	Rent rate for Saman land.	Excess rate of rent for land classed as irrigated No. II above Saman land.	Excess rate of rent for land classed as irrigated No. I above Saman land.	Rent rate for Saman land.	Excess rate of rent for land classed as irrigated No. II above Saman land.	Excess rate of rent for land classed as irrigated No. I above Saman land.	Rent rate for Saman land.	Excess rate of rent for land classed as irrigated No. II above Saman land.	Excess rate of rent for land classed as irrigated No. I above Saman land.	Average rate for Saman land.	Excess rate of rent for land classed as irrigated No. II above Saman land.	Excess rate of rent for land classed as irrigated No. I above Saman land.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Korai No. I	35	R a. p. 0 11 11	R a. p. ...	R a. p. ...	R a. p. ...	R a. p. 1 4 3	R a. p. ...	R a. p. 0 13 6	R a. p. 0 15 0	R a. p. ...	R a. p. 0 11 3	R a. p. 0 15 0	R a. p. 0 7 6	R a. p. 0 11 3	R a. p. 0 15 3	R a. p. 0 7 3	R a. p. 0 11 6
Berghat No. V	75	0 14 0	1 6 11	...	0 12 11	1 3 4	0 9 4	0 12 8	0 14 4	0 7 2	0 10 9	0 14 4	0 7 2	0 10 9	0 15 1	0 8 3	0 11 10
Agh No. VI	60	0 12 6	1 1 7	...	0 9 11	0 14 10	0 7 2	0 9 11	0 11 0	0 5 6	0 8 3	0 11 0	0 5 6	0 8 3	0 12 5	0 5 5	0 9 1
			1 2 4	...	0 11 10	1 1 11	0 8 4	0 11 10	0 13 9	0 6 4	0 10 4	0 13 8	0 6 1	0 10 0	0 14 5	0 6 11	0 11 0

Note.—The rent rates have been calculated from the all-round rates by application of the soil factors, areas of less than 100 acres have been omitted for the sake of simplicity.

APPENDIX IV.

Some details re effect on cultivation of the seven tanks proposed (in stage II) by the Public Works Department.

Serial No.	Name of village in which the tank lies.	RICE AREA AT SETTLEMENT 1894-95.		AREA THAT CAN BE IRRIGATED BY THESE TANKS.						RICE LAND THAT WILL BE SUBMERGED BY THE TANK.				BARMA LAND THAT WILL BE SUBMERGED BY THE TANK.				REMARKS.				
		Irrigated.	Unirrigated.	Irrigated this year.	Area at present irrigated but fallow.	Area cultivated but at present unirrigated.	Fallow or waste land not now irrigated.	Total columns 6 to 9.	Total extra irrigation columns 8 and 9.	Cropped this year.	Fallow this year.	Grass.	Irrigable at present.	Unirrigable.	Cropped this year.	Fallow this year.	Grass.					
1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Sarekha Bibhari	286	179	225	68	171	63	527	234	11	3	..	..	14	..	..	..	..	..	..	..	14
		246	145	145	44	169	15	373	184	7	3	..	..	10	..	..	..	..	..	..	..	10
		130	236	109	108	179	..	396	179	..	..	..	..	..	..	..	..	..	..	..	..	..
	TOTAL	642	560	479	220	519	78	1,296	597	18	6	..	..	24	..	..	..	..	..	..	..	24
2	Arandia	212	331	153	30	300	50	533	350	26	12	..	..	38	..	..	..	..	15	..	..	53
		246	145	53	24	40	..	117	40	..	14	..	..	14	..	..	..	..	..	..	..	14
		..	..	..	..	..	..	..	..	..	11	..	..	11	..	..	..	..	..	..	..	16
	TOTAL	458	476	206	54	340	50	650	390	26	37	..	..	63	..	..	..	..	20	..	..	83
3	Roomal	93	364	50	60	367	..	477	367	1	14	..	..	15	..	..	..	..	17	..	..	61
		252	150	72	142	192	..	406	192	..	23	..	..	23	..	..	..	..	12	..	..	47
	Kanchanwara	174	106	35	100	175	..	370	175	..	..	..	..	..	..	..	..	..	..	..	..	..
	Newragoon	111	106	85	20	174	..	279	174	..	..	..	..	..	..	..	..	..	..	..	..	..
	Jhittarra	63	282	140	..	282	..	372	232	..	..	..	..	..	..	..	..	..	..	..	..	..
	Baoli	192	159	10	155	202	..	367	202	..	..	..	..	..	..	..	..	..	..	..	..	..
	Ghatkharpara	45	92	..	40	100	12	152	112	..	..	..	..	..	..	..	..	..	..	..	..	..
	Betna	35	149	..	..	218	..	218	218	..	..	..	..	..	..	..	..	..	..	..	..	..
	Tikri Bamhni	145	170	4	..	335	..	339	335	..	..	..	..	..	..	..	..	..	..	..	..	..
	Sarasdol	39	115	17	20	127	20	184	147	..	..	..	..	..	..	..	..	..	..	..	..	..
	Gorakhpur	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	TOTAL	1,154	1,693	413	537	2,122	32	3,104	2,154	1	37	..	..	38	..	12	..	..	41	..	..	108

Mr. A. Mayne. 1. Q. (The President).—You are the Deputy Commissioner of Seoni?—Yes.

17 Mar. 02. 2. Q. You have been there for nearly two years?—Yes.

3. Q. Have you had famine experience? Have you been in this province through the famines?—Yes, in both the famines.

4. Q. Were you in charge of famine operations?—I was in entire charge of the operations in Seoni in the second famine. I was the Settlement Officer in Balaghat in the first famine.

5. Q. You say in reply to paragraph 4 of Question 3 as regards the nature of soil, "Just as the cultivation of cotton and juari have spread, so it would be possible for the practice of irrigation of rice to spread to black cotton soil tracts, which from the mildness of their undulations are irrigable. Such a change in the cropping and in the method of agriculture would, however, not be an insurance against famine, but would involve an increased risk of famine; for experience has shown that inasmuch as the irrigation of each year must of necessity depend mainly on the rainfall of that year, black or brown soil devoted to unirrigated rice is more susceptible to famine than if devoted to unirrigated rabi crops." Do you count that in a famine year there is unirrigated rabi crop matured at all?—Certainly, as regards the tracts that I refer to—Seoni and Balaghat.

6. Q. Do you mean to say that unirrigated wheat is grown there through all this time during famine years?—I was not in Seoni in the first famine; and in the second we had a very fair crop. It varied from 7 to 14 annas,—that is to say in the richer tract.

7. Q. Do you happen to know whether that is the usual thing throughout the Central Provinces? In these years did the wheat crop in the Nerbudda valley mature fairly?—I did not say that. But I understand that it was not very bad.

8. Q. Viewed from the point of view of famine protection, if in the worst famine one can get irrigated wheat crop, it is a better form of protection than rice crop which depends upon tanks which may run dry?—You are talking of rich black soil?

9. Q. Yes.—Wheat crop in flat valleys did very well in the first famine, but not so well in the second.

10. Q. (Mr. Muir-Mackenzie).—The wheat that did very well—was it in embanked *haveli* land?—Most of our wheat tract is not embanked. Embankment is the exception.

11. Q. In Seoni?—Yes.

12. Q. So that wheat that did very well was on unembanked fields?—Yes, in unembanked but fairly level parts.

13. Q. (The President).—In reply to paragraph 5 of Question 3 you say, "The obstacles to the extension of irrigation are the difficulty and cost of making a suitable tank. Where there is no nalla of convenient size, no irrigation is possible. If the land is too near the top of a catchment area, no tank is worth making. If it is too far, so that the only streams are violent rivers in the rains, no irrigation can ordinarily be made." Do you mean to say that the tanks would fail?—A tank is too big a thing and they have not got money under the existing circumstances to make it.

14. Q. The tanks I suppose such as there are, are looked upon as the private property of the *malguzar*?—Some are absolutely his private property, but many are village tanks in which he has the lion's share of the interest.

15. Q. He is not looked upon as the absolute owner of the village tanks? Other men have got rights in it?—They have rights in every case in which it is recorded as a tank, but many tanks are really recorded as fields from which irrigation is given and they are private property.

16. Q. What is the custom or the law as regards the maintenance of the tank which is considered to be the property of the village? Who does the necessary repairs at stated times year after year?—As a rule the *malguzar* takes the initiative and calls upon the tenants to assist him in the work. If it is an absentee or a negligent *malguzar* he does nothing. But if any tenant is in any way interested in the tank, he will either do it or get assistance from others and do it.

17. Q. Could you say, generally speaking, that the tanks are in a fair state of repair?—Hardly.

18. Q. This is a question which we had to face wherever we went. In different places it is answered differently. My colleagues will agree with me that,

generally speaking, in Southern India the question is not the least solved. But one thing is certain, that their condition is not satisfactory?—I agree in that. I have a list of villages in which there are tanks and they are not in the condition that they ought to be in for obvious reasons.

19. Q. Is there any power to put pressure upon the *malguzar* to keep the tank in repair? Can you, as Revenue Officer, have any kind of authority to put pressure on him?—No; in individual cases I may advise.

20. Q. I suppose whether it is repaired or not, he will have to pay the wet rate of assessment?—You mean for the currency of the settlement?

21. Q. Yes.—If not repaired at the next settlement, he will ordinarily escape the wet rate.

22. Q. You say in reply to Question 5, "If the *malguzar* makes a tank, tenants will not much pay for water, save in years of failure of rain. These are still the exception. The irrigation of one's own rice land is a prudent method of investing savings and may justify raising a loan. The irrigation of other people's land will rarely pay, for in many years they will give little for the water, and in the years when they would give much there is usually none to sell them." Would not the *malguzar* who provides the tank have the support of the Revenue Officer in raising his rent on the tenant?—He would get an increased rent at settlement, but meanwhile he would get nothing unless there happens to be a bad year when he could sell water.

23. Q. Between the settlements?—Yes.

24. Q. You say in the same paragraph, "Irrigation of rice is mainly of value in enabling better cultivation. It is a partial safeguard against famine. With such land as we have it can only in rare cases be a complete safeguard." That is, you could not raise the rice crop without the help of some rain?—A great deal of rain is required.

25. Q. I suppose you do not mean that the rain must necessarily fall upon that particular place? If water could be brought from a canal or a stream, whether there was rain or not, that would meet the circumstances of the case?—It might be theoretically possible but not in practice. What I meant to convey was that when the rainfall fails seriously, nearly all our irrigation necessarily fails. Tanks do not fill.

26. Q. Little further on you say, in reply to paragraph 2 of Question 5, "I would only recommend remission of interest where persons are to be induced to take loans in famine time to provide employment for labourers. It does not seem to me necessary or advisable to pay persons to improve their cultivation." On the other hand would you admit, the more the irrigation the better? I suppose it is to the interest of Government that as much area should be under irrigation as possible?—I think, Sir, the tendency is, the more we do the less the tenants do. That is shown by the experience of the famine. The tanks which we made for them they have failed to repair.

27. Q. As regards loans for tanks and wells or for any of these purposes, are people keen about them?—Not very keen, except in famine times, when they are keener.

28. Q. You say that now they are hard up and in debt they do not care to enter into new loans. That is quite natural. Can you dispose of the money in loans with the assistance such as is given you? Have you ever put off granting loans because you have not got the funds in your hands?—I doubt if one would have lack of funds. When one scrutinizes the loan applications, not from the point of view of the man who requires loans but from the point of view whether they can really spend it on useful works, the demand for works is not very keen. We have only advanced extremely small sums.

29. Q. How much?—About Rs. 1,000 or so.

30. Q. That is all?—Yes; next to nothing, apart from famine.

31. Q. You mean that for such improvements as the making of bunds round fields or the making of wells, you practically advanced money on a very small scale during all these years?—Yes.

32. Q. Don't you think it would be good policy rather to stimulate those loans? I suppose the ordinary *malguzar* and the cultivating classes know that they can get advances by applying?—They all know that.

33. Q. It is so very different in different places. Mr. Muir-Mackenzie will tell you that in the Bombay Presidency they have been giving lakhs in one dis-

trict?—I have several applications pending with me now.

34. Q. Is there any complaint made of the length of time required for applications to be disposed of? We have had, in some places, complaints made that it took six months to get an answer. If a man wanted to dig a well, and sent in an application, he would not get an answer either the one way or the other for a long time. Had you complaints of that sort?—We have had complaints, but they were on a very small scale, as the applications were very few. We have hardly any complaints of that kind.

35. Q. In some places we have had strong representations made that there should be an officer attached to the district with nothing else to do but to grant loans?—I am afraid he would have no work. For fear that I might convey the impression that the people cannot get money, may I say that I made enquiries in many villages if they would take money, and I found that at present there was no desire at all.

36. Q. Do you think that is chiefly due to the general poverty or the indebtedness of the tenants or to a want of energy on their part, or what is it?—Partly to poverty, but more largely to the fact that so many tanks have been made gratis.

37. Q. And they hope that they will get theirs gratis too?—Yes.

38. Q. With the view of protecting these provinces from the losses similar to those they went through in 1899, what policy would you advocate on the part of Government?—I am afraid I have no policy save for rice tracts.

39. Q. What would you suggest for rice tracts?—There the first step would be to construct some large tanks which would protect effectively a substantial area, say 25 per cent.

40. Q. Do you contemplate tanks which would irrigate directly or which would irrigate through supplementing existing minor tanks? You see the distinction between the two? You may have a reservoir of water in the back ground, if there are no engineering difficulties, for supplementing the various existing tanks or you may open up an entirely new field for irrigation under a big new tank?—Both.

41. Q. Do you think that there are probable sites for tanks on a really large scale to irrigate directly the country below them—two thousand or three thousand acres of new irrigation?—I know several such.

42. Q. Do they come into Mr. Harriott's scheme?—There is one that comes, viz., the Rimal tank.

43. Q. I suppose you would say that the strength of these tanks is that they draw their water from a large catchment basin and would be less likely to fail in times of need than they would otherwise?—Yes. It is not only the size of the catchment basin, but that they draw their water from the ghât with steep run-off of several hundreds of feet.

44. Q. Where there is more rainfall than elsewhere?—We have no knowledge if the rainfall is more; but there should be more run-off than on flat ground. [The witness was next asked to explain his answer to Question 28, and he thereupon pointed out that it needed some corrections and he made the necessary corrections].

45. Q. I gather that well irrigation does not count for much in your district?—Hardly any.

46. Q. Of course it is not at all a common thing for the cultivation of rice. It is not unknown, but it is not common. Is there any wheat to speak of on the land under the wells?—I have seen rare cases of men sowing wheat on fields where they generally grow vegetables. That is all. I have met some malguzars who tried it, but they told me that they did not find it a success.

47. Q. What is the difficulty? Is the difficulty about bullocks or is the supply uncertain?—Mainly on account of the land that is under well irrigation. It is called 'kachchar' land, where vegetables are grown better than wheat.

48. Q. Do they grow Indian corn upon it?—No. Indian corn grows almost everywhere round village sites.

49. Q. I suppose it is the same with juar?—Yes.

50. Q. (Mr. Muir-Mackenzie.)—Is Indian corn raised without irrigation?—Yes.

51. Q. Do they grow sugarcane?—We have very little. It is dying out.

52. Q. Do you know the reason of its dying out?—I have found on enquiring into a similar decrease in Betul four years ago, where sugarcane had been some-

more extensive, that the reason of its dying out was that they could not produce it at the same price as imported sugar.

53. Q. Do you mean imported gur or imported refined sugar?—Both are imported, especially gur.

54. Q. Is the cane that is grown chiefly grown for gur or for eating?—In Seoni we have so little of cane that I think it is grown for eating. But in Balaghat it was previously grown for gur chiefly, and they had rather a big industry.

55. Q. (The President.)—I suppose during these years of drought wells held out better than tanks?—In the second famine tanks did not hold out at all, and wells held out very badly.

56. Q. Are they pakka wells?—I have almost the best well in Seoni town. After a week's irrigation with a pair of bullocks, to save my garden, I had to stop it, because it was nearly dry.

57. Q. (Mr. Muir-Mackenzie.)—How deep?—About 32 feet.

58. Q. (The President.)—Have you known cases of wells being deepened?—We deepened hundreds of them.

59. Q. With what results?—Frequently the water went lower and lower till there was no more.

60. Q. (Mr. Muir-Mackenzie.)—What were the wells that you deepened—irrigation wells or water-supply wells?—They were nearly all for water-supply.

61. Q. (The President.)—But your well must be an irrigation well?—All our station got its water-supply from it.

62. Q. (Mr. Muir-Mackenzie.)—Still you got enough of water from it for the station?—By giving up the water for the garden we got enough for Club soda-water.

63. Q. There was a certain amount of water still remaining?—Yes. But we were using it sparingly.

64. Q. The point I am aiming at is this: the effect of deepening wells is to find out a certain amount of water which might perhaps be useful for irrigation. You deepened chiefly for the purpose of water-supply, because people were not in the habit of irrigating from wells?—I did not deepen my well.

65. Q. You deepened a number of wells, and I gather from what you said that a certain amount of water was found. If they deepened the wells for irrigation purposes, they would have found more water?—In some of the wells that we deepened we got no water at all, the strata being very faulty. We could not reckon up on finding water by deepening the well. We could reckon on finding water by digging a well in the bed of sandy streams.

66. Q. Had you to go to the neighbourhood of streams?—Yes, very frequently, quite close. I tried the deepening of some wells in Seoni, but they were a great failure.

67. Q. In other parts of the district did it generally succeed?—In the north of the district where the soil was rocky we are generally unsuccessful.

68. Q. In the rest of the district?—In the south we got water generally by striking wells in the bed of dried-up streams.

69. Q. Did you deepen the wells in the bed of streams?—They deepened almost everywhere.

70. Q. Did you get water?—In some cases, but not largely.

71. Q. More often you failed than succeeded?—Yes. There might be some muddy water trickling at the bottom of a well which would suffice for a few people and that is all.

72. Q. (The President.)—Have you got the programme of famine relief works for your district?—There is one under revision. We have one, but I am making enquiries for revising it, because it is not up to date. As regards roads the programme is revised, but as regards tanks it is still in progress.

73. Q. Have you got an Executive Engineer attached to your district?—The Jubbulpore Executive Engineer has also charge of Seoni district.

74. Q. What is the exact arrangement as regards the programme? Do you make it in conjunction with him or do you send him what you want? Who takes the initiative about it?—He prepares it for roads and I prepare it for tanks.

75. Q. I suppose it is kept up to date yearly?—Yes. The changes of the last famine were so numerous that we thought it better to revise it entirely as regards tanks.

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76. Q. I am sorry I have not had time to see the note you sent in. I saw it only this morning. I read it only cursorily. Would you advocate Government constructing and maintaining all these little tanks as well as big tanks?—I do not think we could do it successfully at any rate at present.

77. Q. Do you think it is a thing to be aimed at? I would put it in another way. Since the custom of the country has been that these things should be done by malguzars and his people, would it not be better to leave the thing to them, putting such pressure as one can upon them to keep their tanks in repair rather than take them out of their hands altogether?—In that case we must give up the idea of protecting a large portion of the rice tract, because they are not capable of the necessary prudential self-denial to keep their tanks in proper condition.

78. Q. The law would not help you? You could not put any pressure upon them?—The difficulty is this: that as a rule the malguzar looks after his own interest. The tenants hold more than $\frac{3}{4}$ ths of the land, and are too disinclined to make tanks, and the malguzar will rarely make them for his tenants. He will make them for himself, and they get some benefit.

79. Q. These tanks, I suppose, are to be counted by the hundreds? They are very small, I presume, in most cases?—Yes. I have a list of tanks from the examination of 70 villages. If it could be of any use I would put it in.

80. Q. Give it roughly. In 70 villages how many were minor tanks?—66 tanks out of repair and 18 proposed new sites.

81. Q. That makes not more than one tank per village?—Yes.

(Mr. Muir-Mackenzie.)—Besides those which are out of repair there are a considerable number in repair?—These are exclusive of all tanks which could be left as they are.

(The President.)—Have you got a note as to how many tanks there are?—The note that I gave you shows there are 732 for the rice tracts. That is a little over one per village in use at present.

82. Q. You don't look upon the thing as out of question that Government should manage all these tanks?—I think it would be a mistake to try it. But we have gone a long way towards it by already making scores of tanks which are not looked after.

83. Q. Have you made scores?—I made 35 and the Public Works Department made about the same number.

84. Q. In your district?—Yes; in my district in the last famine.

85. Q. What is to be done with these?—I have taken an agreement from every malguzar that he will keep it in repair and arrange for the irrigation of lands under it, and it is almost a waste paper.

86. Q. Because there is no way to enforce the agreement?—Because I have been absent from the district. But I am going to worry them. One or two of them need incessant care to keep them up to the mark.

(Mr. Muir-Mackenzie.)—If you put pressure upon them would you make malguzars repair them? Have you sufficient power?—If I stay I can do it. I can strike them off the visiting list and take other steps. They will see that they cannot get a fair hearing in anything they desire to represent. But we are constantly changing, and I cannot depend upon my successors doing it.

(Mr. Rajaratna Mudaliar.)—Of course you can put pressure, but what inducement would you offer to him in the shape of a return?—He has already got a good tank in return for nothing.

(Mr. Rajaratna Mudaliar.)—He would not get any revenue because people will not take water.

(The President.)—They do take water I understand.

(Mr. Rajaratna Mudaliar.)—That is the difficulty.

(Witness.)—They are largely used for irrigation.

(Mr. Rajaratna Mudaliar.)—What is the profit that he gets from his outlay?—He has so far had no outlay.

(Mr. Muir-Mackenzie.)—What is the profit? Does he get increased rents from the tenants who are now using these tanks?—I have not heard of any case in which action was taken to increase the rent. In most cases he gets some irrigation.

87. Q. For his own land?—Yes. If he liked to put pressure on his tenants and see that they assist him in repairing the tanks, they would join him in the work because they get irrigation. But nobody takes the lead, because no one paid the capital for making or

improving the tank. In many cases the tanks which are out of repair belong to people who are proved to have been improvident and they have been allowed to get out of repair.

(The President.)—What is your suggestion? Do you want legislation to help you?—I should suggest that we should take up the construction of large tanks and by doing so we shall get the staff and the experience by which we can keep steady pressure upon the people in regard to their other tanks. At present our difficulty is that hardly any of us knows anything.

88. Q. Through whom would you work?—We have to work through our subordinates and if they are helpless we can do very little. It may happen that a Tahsildar who may be put in the rice tract may know nothing about rice cultivation.

89. Q. Would you strengthen the hands of the Deputy Collector? Would you give him an Inspector of Tanks with peculiar knowledge of the subject to go about the country and report on the state of the tanks?—If the Deputy Collector himself knew something about the irrigation of rice and rice cultivation it would be invaluable.

90. Q. But he is pretty busy with other things?—When he tours in the cold weather through that tract he could attend to it, but at present he has not the means or the information necessary to do it, except what he sees in the course of his tour.

91. Q. Can you suggest any channel by which communication could come to him regularly? I suppose the Tahsildar does not know much about tanks?—I had a Tahsildar who made many tanks but they took him away. The question is how far we are prepared to go. If we go and make a big tank in Seoni we cannot have a big staff. But if we make half a dozen tanks for which we can find sites, we might have a big staff, and with the help of that staff we might assist the people in keeping up the village tanks.

92. Q. But that staff would finish their work in about 10 years. What you want in the way of staff depends upon what annual grant is given?—I suppose we shall require a Sub-Divisional Officer or some such competent person to look after them.

93. Q. You say in your note, "commencement of such a scheme for famine protection by large tanks has been made during this cold weather by the Public Works Department, and a list of seven projects was sent to me to report on. My enquiries have led me to the conclusion that five of the tanks are certain to fail in being protective works in a year of drought such as 1899." That is rather sad. But they profess to be protective works in the time of famine?—No. At an early stage they had to take what schemes they could get. They were given a list of places by district officials and the projects were drawn up for those in the list and they were sent to the district officials to see whether they would be really protective. I have made an inspection of the places after the report was called for from me, and I am the only officer that had been to them, and therefore I can say definitely that five of them could not be really protective. It was with that object the list was sent me.

94. Q. Is it because the catchment basin is not such as would readily hold water in a dry year?—Five of them are certainly very small. The main objection is the water which is caught will form a large shallow tank which must dry up.

(Mr. Muir-Mackenzie.)—What has Mr. Harriott got to say? Does he agree in that opinion?

(Mr. Harriott.)—They have been worked out in the same way as other projects have been worked out.

(The President.)—As a matter of fact, do you think that what Mr. Mayne says is correct: that these tanks would not fill in such years as they have had?

(Mr. Harriott.)—They would not fill, but they would have such water as may be required.

(The President.)—Are you satisfied that the calculations are properly made?

(Mr. Harriott.)—Yes. There will be a detailed survey when we do the projects.

(The President.)—Mr. Mayne has given closer attention to them than you have done?

(Mr. Harriott.)—I do not think he has measured the catchments. Catchments have been taken from the one-inch map.

(Witness.)—The difference in the catchment area could only make a small difference.

(The President.)—It is the run-off of the catchment basin that you must consider?—Yes. In the case of tanks which are shallow, the loss would be so

great from evaporation that the area to be irrigated in a famine year would be greatly reduced.

(Mr. Harriott.)—We have allowed for evaporation 6 feet.

(Witness.)—I understand that you start the year with a full tank.

(Mr. Harriott.)—No. We start after giving one watering in October.

(Witness.)—Shall I bring a map and explain it?

(The President.)—I do not know if we are called upon to go into individual projects. I think it is sufficient that Mr. Mayne has brought the point to our notice. I have no doubt that Mr. Mayne and Mr. Harriott would go into them. I do not think we should form a Court of Arbitration here in regard to these projects.

(Turning to the Witness.)—What you say is, the correspondence of the Public Works Department showed the absence of more trustworthy information and that the calculations were based upon data which were drawn upon, in some cases, in such a manner as they could not apply to this district. All that you say is that these tank projects are founded on insufficient data?—They are founded on data for broadcast rice, but our rice is transplanted. I have given the correct data, so that, if necessary, they could be revised.

(Mr. Higham.)—I understand that all your present village tanks failed in the last famine?—Almost all failed entirely.

95. Q. There are some that did a little good?—A few saved a small percentage of the area below them.

96. Q. The general fault of these tanks, I understand, is that they do not hold all the rainfall that comes down, they are too shallow?—Many of them suffer from insufficient catchment area and others from insufficient capacity, and lose the rainfall.

97. Q. That is what I mean to say. It is the general characteristic that either they have insufficient catchment or they have insufficient capacity?—In the last famine the fault was that the catchment area was insufficient and the run-off of the rainfall was very small.

98. Q. That was with reference to that particular year; but in the previous year the probability was that a lot of water ran off that might have been stored, and if stored, would have been available for the dry year?—Unfortunately most of it would not have been available, because the ground is so flat and the tanks are so shallow, that any water that is stored is lost by evaporation before the next rains. In 1896-97 in Balaghat a large number of tanks burst, because there was a very heavy rainfall. Then the later rains failed, and so they suffered from both causes.

99. Q. You don't think that the capacity of these private tanks in Seoni could be usefully increased? The ground is so flat that the tanks would not hold water?—As a rule their capacity cannot be increased, because they will submerge other cultivation. There is constant quarrelling between the people. There are fields above and below, and when the owner of the field below gets irrigation the owner of the other field complains that his crop gets rotten on account of water standing in his field.

100. Q. Really nothing can be done in the way of improving the tanks?—Perhaps in a quarter of the villages, certainly in a good many of the villages we can substitute better tanks.

101. Q. Do you mean Government tanks—large tanks?—Yes.

102. Q. I am not thinking of them now. I am thinking of what can be done to the existing tanks through the agency of their owners or of doing them as famine relief works?—Many of them can be repaired with advantage, but in good many cases nothing can be done.

103. Q. You say that the Public Works Department made a number of new tanks in the late famine?—Both the Public Works Department and the Civil Department made an equal number in Seoni.

104. Q. I suppose they were all small tanks?—They ran up to Rs. 4,000 and Rs. 5,000 from Rs. 1,500. I don't think that they have anywhere exceeded Rs. 5,000.

105. Q. Were all of them completed?—I only remember one incomplete one. That was not made by the Public Works Department.

106. Q. They are made over to malguzars?—Yes.

107. Q. Do you think that there is no hope of the malguzars keeping them in repair?—They are not putting the sluices. They should do so.

108. Q. They have had only one year?—This is the most important time to do these things when the earth is fresh. Two of these big tanks would burst in these rains.

109. Q. Why?—Because they did nothing last year even though only little repairs were necessary. This year they would burst unless something is done. When I say big, I mean that the cost was Rs. 4,000 each.

110. Q. (Are there not proper waste-weirs or run-off arrangements? Do you leave it to malguzars to make them?—Both of them were made by the Public Works Department. They always put waste-weirs; but the explanation is that in consequence of famine labour there was insufficient beating down of earth, and in the first rains a lot of the bank had fallen in. Instead of spending Rs. 20 or Rs. 30 at the time, they left them as they were.

111. Q. Rupees 20 or 30 would not be enough to spend on banks which had not been properly consolidated. Probably you will have to make new banks?—No. There is only one weak spot. The earth has given way only in one place.

112. Q. In the case of tanks that have been in existence for many years, is there no provision in the Wajib-ul-arz by which you can enforce the maintenance of tanks?—I do not know about Seoni. I introduced a new provision for Balaghat in the new Wajib-ul-arz, when I made the settlement that if the malguzar failed to keep the tank in repair and give water, he could only recover rent at the dry rate. But there is no such provision, so far as I know, in Seoni.

113. Q. I understood from some of our witnesses that there is no difficulty in enforcing the repairs of tanks, as the conditions are entered in the Wajib-ul-arz?—Wajib-ul-arz contains a general statement that they will keep them in repair. But in practice they say that they are poor men.

114. Q. On that ground you cannot enforce his liability?—Yes.

(Mr. Muir-Mackenzie.)—You can fine them up to Rs. 200?—Yes, but I forget the figure. The tanks are so many and the day's work is so heavy that one cannot take the responsibility of seeing that the repairs to these numerous tanks are carried out.

(Mr. Higham.)—I understand from you that it is practically hopeless for Government to propose any improvements for small village tanks or to construct any small tanks because they would not be maintained?—Some of them are well maintained, but if you start constructing these tanks on a large scale people will not maintain them on a large scale.

115. Q. All that the Government could do is to make large tanks and maintain them and themselves to charge a water-rate?—Yes, at present. In time we might hope to do more.

116. Q. Do you think that if such tanks were established and successfully worked, we might look to the people to make greater efforts to dig tanks of their own?—Partly they would make greater efforts and partly we should be more qualified by experience to instruct them and, if necessary, to put pressure on them as regards village tanks.

117. Q. Of the schemes that have been proposed in the Public Works Department, you say that five are quite useless as protective works?—Yes, I said so. At present it is difficult to say anything definite, because our data are so very uncertain. As regards the duty of water, it varies as much as four times. Mr. Harriott's figures are 5 inches. My *locum tenens* laid down the figure at 1½ feet.

118. Q. Five inches for watering?—Five inches duty for irrigation per acre in a normal year.

(The President.)—Do you mean 5 inches deep?—Yes.

119. Q. We calculate in cubic feet?—It is 1,600 cubic feet. That is one-third of the figure taken by the man who was acting for me. I cannot give the figure yet, but I think 5 inches would be found inadequate as far as I have worked it out in Balaghat where it was considerably more.

(Mr. Higham.)—You propose taking a lot of observations on that point during the coming monsoon?—Yes.

120. Q. Have you the means and the establishment for taking the observations?—I have an intelligent Inspector on special duty whom I trained; and if he is left with me for another six months and some assistance is given by the Sub-Divisional Officer we can get a very valuable record of actual facts.

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121. Q. You will only do it on some of the larger tanks. You could not do it on small tanks?—We could probably do it with all the tanks, within a convenient area, say a dozen or so, so that he could do his rounds in rains and take his measurements.

122. Q. You shall have to keep a gauge to notice the rise and fall from day to day?—It need not be from day to day. As long as we know when the tank is full and what water is taken off that would be sufficient. The difficulty I found in my enquiry last month was that people irrigated practically what were impossible areas from certain tanks.

123. Q. You must observe them day by day because you have got to take count of replenishments?—While irrigation lasts observations would have to be numerous. That is why I suggested a limited number of tanks within an accessible distance. We can get a dozen within a radius of 3 miles in Barghat tract.

124. Q. Which are the five tanks that you mentioned?—Roomal is the best and Chirchira is the next best. The rest are small shallow tanks.

125. Q. Roomal is put in class A, which means that it is a comparatively inexpensive tank for the area it commands. Do you know anything about it?—I inspected the site in company with the Sub-Divisional Officer. I believe myself that firstly there will be more water than is put down here as capable of being stored.

126. Q. You are disposed to think that it works out better?—It will protect more than what Mr. Harriott allows in an ordinary year. I do not think it can possibly work out as well for a year of drought.

127. Q. In ordinary years it would be better than what is put down in the statement?—Somewhat better.

128. Q. In these tables they talk about the area irrigable in an ordinary year and in a year of drought, but according to the ideas that are now put forward by the Public Works Department, there is no difference between the two. Because in ordinary years the irrigation would be limited to the areas that can be protected in a year of drought. I understand that you think it would not be the principle upon which you would take the works?—As far as we have the data at present they do not point in that direction. These areas in column 14 are calculated on a duty of 2 feet.

129. Q. For a year of drought?—Yes. As far as I can test it, it seems to be below the mark, so that these areas are likely to be reduced.

130. Q. I think the areas are worked out for a cycle of 3 or 4 years and there would be much less than 2 feet per acre in a wet year when only 2 or 3 waterings are required, whereas these tables allow 3 feet in drought?—Yes, but the calculations are based on the assumption that the tanks are full at the beginning of the year of drought and loses 6 feet by evaporation, so that no amount of forbearance in the previous year could give more water.

131. Q. You forget that even in a year of drought you require some amount of replenishment?—That has been allowed for.

Mr. Harriott.—Mr. Mayne is speaking of the old estimates. In the estimates which we have worked out we have allowed for one watering in October. We have allowed for water drawn off in the previous year which would not be replenished.

Mr. Higham.—In a year of drought what depth do you allow?

Mr. Harriott.—2 feet for transplanted and broadcast rice in Seoni.

Mr. Higham.—Is that 2 feet exclusive of what may be got during the year?

Mr. Harriott.—Yes.

Mr. Higham.—You take 2 feet out of the reservoir?

Mr. Harriott.—Yes.

Mr. Higham.—In addition to that there will be replenishments during the year. Is that so?

Mr. Harriott.—Yes.

Mr. Higham.—The question I am asking you is whether the irrigated area should be limited to the area that can be irrigated in a year of drought?—I would suggest that if there is a great difference between the two and if the area to be protected in a year of drought is much smaller than the area in normal years, there would be little gain in keeping down the irrigation in other years, because some of the tanks are so shallow that the water would dry up of itself if it is not used.

132. Q. I understand that we cannot actually estimate the area that will be irrigated in normal years, because in normal years people would not take water?—Our statistics show that they do take water from village tanks in normal years.

133. Q. Do you think we can rely upon getting rid of your water in tanks in normal years, supposing you do not want to store it till next year?—Judging from the experience of village tanks, I think that in almost every case you can get rid of the water in normal years.

134. Q. It is really a question of what the depth of the tank is?—Yes; mainly in the new projects that have been surveyed they will lose between 7 and 8 per cent. by evaporation.

135. Q. Your point is this: if the proportion of loss by evaporation is not excessive, it might do to store the water for the dry year. But if it is excessive it is better to make the best of it in normal years?—Yes. It might be better to store it as long as there is not a great discrepancy. If 4 feet of duty is required for a year of drought and 6 inches for an ordinary year, $\frac{1}{3}$ ths of the water is not used for many years.

136. Q. Looking at the matter not from the protective but from what we may call the commercial point of view, you think you would be able to get a high return by letting the water every year to any one that would take it rather than by guaranteeing the protection to a smaller area in a year of drought?—I think you would probably get a good deal more by supplying water every year to as large an area as would take it.

137. Q. I think you say the most you can expect is 12 annas?—11 annas is the rate paid at present for really good irrigation.

138. Q. That is the rate that you would get if you rented your tank water?—You would get very little more. I doubt if you would get quite as much.

139. Q. If you take a smaller area and insure it a regular supply in all years, wet or dry, so that it may have an unfailing crop, you would get a very much better rate than 12 annas on that smaller area?—I doubt it. They would not pay for insurance.

140. Q. They would not pay for insurance if put in that way. Suppose after a number of years you find that a particular area is insured, would you not increase the assessment at the next settlement? Supposing the land has been irrigating rice or any other particular crop regularly, the insurance rate could be obtained by increasing the assessment on the land. Is that out of the question?—The rates would already go up on account of the country being developed. I doubt if you would get your money on the ground of the land being better protected.

141. Q. If they had an unfailing crop, while their neighbours lost, would you not assess them more?—Every one would also have had more.

(Mr. Muir-Mackenzie).—Would it give protection in a year like 1896-97?—Yes. A year like that is much more common than a year of complete failure.

(Mr. Higham).—If you irrigate in the way you propose, when a year of drought came, you would have to send all your people on famine relief?—You mean people from the particular villages in which tanks have been constructed?

142. Q. Yes, because the tanks will break down as a matter of protection?—In most of these tanks you would have very little, inasmuch as they are shallow tanks. In the case of deep tanks, you might give a little more protection.

143. Q. Supposing the Government made a number of tanks and from them you fill a number of existing private tanks, would they be able to charge a rate for that water? Would they get the same rate as they would get for irrigating land from a new tank?—What people would like is to pay for water when they need it. Under these circumstances the Government will get nothing unless the next monsoon is a failure.

144. Q. Would they not like that their tanks should be filled in reserve in case they need the water?—They will have the Government tanks in reserve. They would increase the capacity of tanks if the surplus water were allowed to run into village tanks. But it would not increase the revenue, inasmuch as the area under minor tanks is already assessed wet rate.

145. Q. You would not charge them for water?—No. Because the area they would be irrigating will be already paying the rate.

(The President).—You may charge the malguzar for it?—Would you not be charging for irrigation from a Government tank direct?

146. Q. But you give him a second supply and you could charge him, so much per cubic foot?—The average tank fails in an ordinary year.

147. Q. I am taking the year of drought in which the tank fails. I will suppose that October rains fail. You say to the malguzar "I have got water to sell you at so much per cubic foot. Shall I fill your tank?"—He will be glad to take it either directly or otherwise when you have surplus water. But it is impossible to say whether his tank will fill or not.

148. Q. But your tank has to be reserved?—In that case I was thinking whether, as a rule, it would not be more profitable to irrigate direct than to sell water to the malguzar, because many of the tanks are sloping rich fields which would add largely to the productiveness of the country.

(Mr. Higham.)—If you had another famine you would spend money in the Seoni District on improving the present tanks which might not be kept in repair?—We could easily spend several lakhs in repairing the village tanks.

149. Q. Can you spend it on anything better?—No.

150. Q. In the rest of the district where you have no tanks, what would you do for relief-works?—We have in our famine note books a certain number of miscellaneous things such as village tanks for cattle, filling in pits or gathering rubbish near village sites, etc. Besides that we have repairs to roads and the construction of railways in the list of famine works.

151. Q. You have not got a programme for them in your district?—I have not got it. It has been revised on the same lines as regards roads. Our list of tanks is still under preparation.

152. Q. The proposed tanks are all over the district?—We made a few in other parts. In some parts where it is stony, it is unprofitable to construct tanks.

153. Q. For water-supply to the village?—Yes.

154. Q. Are there any roads to be made or have you made all the roads that you want?—I have suggested improving two roads and raising them in class.

155. Q. You find it difficult to get works for that part of the district?—Organisation and staff seem to me to present the difficulty but not works.

156. Q. The last famine was not so severe in that part of the district as in the other parts?—It certainly was not.

(Mr. Muir-Mackenzie.)—Can you employ famine labour at all in the making of embanked fields?—I do to a small extent.

157. Q. Do you think you can do it in future famines?—I gave out some money for the purpose to selected malguzars to get the work done by contract. I gave them Rs. 200 or Rs. 500 or whatever sum was available. I told them that if they spent that money well and if my inspection showed that it was so spent, it would be treated as famine expenditure, otherwise it would be recovered as *takavi* loan.

158. Q. Is that the way to embank fields? Would you not have the works carried out under Government management?—I have always found this method more useful. It is a more difficult work than to make tanks.

159. Q. More difficult to superintend?—Yes.

160. Q. With regard to these tanks that have been made in the last famine and which have been falling out of repair, do you think that the Government ought to have them repaired at once or would you leave them alone?—I propose to have them repaired by the malguzar.

161. Q. By putting pressure on him for the purpose?—Yes.

162. Q. Such as you described?—Yes. In the case I have in view, he is a well-to-do man. Although he is indebted, he has got a large income and can be made to do it.

163. Q. In answer to question 5 you say, "since the famines there is less reluctance to take loans for land improvement." Some witnesses have said that people are in such an exhausted condition that they cannot afford to take any more loans. Is that not the case?—I wrote those answers almost on my return from the Punjab. I based them on my experience before I went away. I should say now, as a result of the extensive enquiries I made, that on the whole there is no keenness for taking *takavi*. There was at the time but it has died out.

164. Q. Is it the reason that people are too impoverished to bear the burden of *takavi* loans?—In a good many cases it is.

165. Q. What other reasons are there?—Men who are really well-off are not disposed to spend several thousands for the benefit, mainly of their tenantry, on the off-chance of the tanks being made at no cost to themselves by Government.

166. Q. You say that the malguzar generally takes the lion's share of the water. Has he a right to that lion's share or is it more than his right?—It is generally a little more,—because he is generally the stronger party.

167. Q. A little more?—Sometimes it is a good deal more. I have found in some cases malguzars complaining that the big tenants take the greatest share.

168. Q. Have you got power to regulate the distribution of water in tanks or do you think that further power ought to be taken by legislation?—I am afraid that power without capacity would be of very little use.

169. Q. Putting capacity on the one side, do you think it would be useful to have the power? You can have the necessary staff to make use of the power afterwards?—Yes.

170. Q. What do you require in order to increase your capacity?—Might I illustrate my point better by taking a concrete case? In the first famine I had many complaints about the way in which water was given. I made local enquiries and settled them. The malguzar nearly always wanted to take more than his share and give a little less to the tenants. I settled the matter in various ways. I would tell the tenants to take the water, and I would tell the malguzar that if he interfered he would go to jail for assault. It was a very effective way of disposing of the disputes. But the difficulty in most cases is that the disputes are in regard to matters that are settled by old standing village customs with which one is not qualified to interfere.

171. Q. What do you require in order to qualify you to interfere?—Mainly long residence in the district and leisure, and next I think, a good *Tabsildar*.

172. Q. A well qualified subordinate would help you then?—Yes, largely.

173. Q. In years prior to famine, you only got rid of about Rs. 1,000 for land improvement loans. Can you tell me approximately how much you would get rid of a year in loans for seed and cattle?—I could not give you the average.

174. Q. The roughest approximation would do. Will it be Rs. 20,000?—The average in recent years would be more than Rs. 20,000.

175. Q. Possibly 30,000?—We have given nearly a lakh of rupees within five years.

176. Q. That is with regard to famine works. I want to know what the normal distribution is to see how much *takavi* is given?—Before the first famine there was only a little demand for *takavi*. I should think that Rs. 10,000 would be about the fair figure.

177. Q. If you had a perfectly free hand for another five years, how much do you think you could get rid of as *takavi* for land improvements. Would you get rid of Rs. 10,000 a year?—I doubt if I could find sufficiently good cases.

178. Q. People would not take money?—I could get it taken, but it would be unpopular.

179. Q. Would it be well used?—Apart from new projects I do not think I could get rid of more than Rs. 10,000. Loans would have to be given to new men which would be rather risky.

180. Q. If you include new projects by which I understand new tanks, how much will you get rid of?—I think Rs. 10,000 to Rs. 15,000 might be spent.

181. Q. You would give it for nothing but tanks?—Small sums might be given for wells or embankments.

182. Q. Another odd thousand for wells—altogether inappreciable?—Yes. It would be small.

183. Q. In answer to question 6 you say, "Give me water at Government expense is the frequent petition. Government has made and improved a number of tanks by famine relief labour and charged nothing to the cultivators who benefited, many of the malguzars whose tanks were not taken up would like the same gratuitous benefits." Cannot Government recoup themselves by raising the rent at the next settlement, if not before?—They will then, if the tank is still in repair and is irrigating the area.

184. Q. Would you not like to see that the tanks are more generally furnished with sluices?—I am afraid I do not know much about sluices.

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185. Q. As it is, they have generally to cut bunds? They use trunks of trees and various other means for letting out water.

186. Q. That is very rough, of course?—That is what is mostly done.

187. Q. Not cut bunds?—We cut bunds in smaller ones. They cut bunds if they want to sow *rabi* in the bed of the tank.

188. Q. Sometimes the *malguzar* cuts the bund to sow in the bed of the tank though it is against the interests of the people below?—There are many disputes about irrigation. Sometimes one side is in the right and sometimes the other side. I think the sluices that you are referring to are for the purposes of safety to prevent bursting.

189. Q. I am suggesting waste-weirs?—They have waste-weirs.

190. Q. In Balaghat a number of tanks breached in 1896-97?—A great number.

191. Q. Is it on account of want of sufficient escape arrangements?—On account of that as well as weak banks.

192. Q. In answer to question 34 you mention *kucha* wells. What happened to *kucha* wells in famine? Were they not dug?—For what purpose?

193. Q. For the irrigation of garden crops?—They went on very much the same.

194. Q. And they found water for garden crops?—I have not got the exact figures. I do not think there was any marked decrease in garden crops as far as I have noticed in passing.

(The President.)—As far as your own garden was concerned there was decrease?—It was not '*kachchar*' land.

(Mr. Muir-Mackenzie.)—Do you think if *kucha* wells had been dug they would have saved a larger area?—If it had been the custom they would have been dug. They saved a small area at that time. That was not the time for an ordinary tenant to go in for wells to any large extent.

195. Q. If men had the means, do you think they could have extended them a good deal?—They have not the experience nor is it in their blood to do so.

196. Q. People have not got the experience, I quite admit. If it had not been for these conditions and the water-supply was sufficient, there was enough of land to enable a good many more *kucha* wells to have been dug with some advantage either for saving more rice or for growing a small *rabi* crop?—I doubt whether they could have saved much of the ordinary rice land which is not close to *nalas* and which has not got water near the surface.

197. Q. They would have saved more land close to *nalas*?—I found a few villages doing it. I did not know whether they did more because it is not in their way. I issued circulars instructing the *Tahsildars* on the subject.

198. Q. If they have plenty of money for *takavi* at their disposal and if it had been pressed a little more, don't you think that they would have done a little more?—They could not have done anything in the last famine. I was talking of the first famine. They could not irrigate the seed beds. They could not put it down in the fields which had no water.

199. Q. That is for rice, but for other crops such as garden crops?—You mean that they might have extended them to garden crops?

200. Q. Yes?—They might have done more, but they are not keen.

201. Q. Would it not be an advantage in your opinion that *kucha* wells should be converted into *pucka*?—Wells used for garden crops?

202. Q. Yes?—I do not think so. They shift them every year. When they exhaust the soil they shift them to another part. I find them doing the same thing in regard to *pucka* wells in Betul.

203. Q. You don't think that anything in the nature of a survey for ascertaining the sub-soil level, to see if there is more field for this *kucha* well digging, would be useful?—Might be very useful I think.

(Mr. Rajaratna Mudaliar.)—As regards *malguzars* appropriating the lion's share of water to their own fields, why should you interfere at all in the matter? As the full owner of the tank, is he not entitled to use the water for his own lands?—He is not the full owner of the tank unless he has the tank in his own field. With regard to the village tank, he is the joint owner, and he is subject to certain duties laid down in *Wajib-ul-arz*.

204. Q. He considers that he is the owner of the village as the *malguzar*?—But he has been collecting rent on the irrigated land on the understanding that the tenant gets water.

205. Q. I will come to that point. Why should you prevent him from irrigating his own fields first?—If he declines to give water to wet lands, he is bound to give a remission?—A mere remission would not cover the damage done by any means. I do not interfere between *malguzars* and their tenants, except in cases where there are serious complaints which seem to me to have a great deal in them.

206. Q. Should he not as the landlord and the owner of the village, and also as the owner of the tank, have preference?—Yes. I have no objection to his having preference.

207. Q. Especially seeing that the tenants won't give him more than 7 annas an acre for irrigating their land?—The complaint is not that the *malguzar* is having preference, but that he is not giving any water to the tenants.

208. Q. Probably there is nothing to spare. We have had it in evidence in Nagpur and Raipur that the *malguzar* is quite willing to sell water if the tenant paid a fair rate?—He pays the rate fixed for him at the settlement. The *malguzar* cannot exact more than what is laid down in the *Wajib-ul-arz*.

209. Q. You said that the *malguzars* should be made to complete the tanks constructed by Government in the recent famine. Would it not be better for Government to complete those works taking the entire revenue to its credit?—It is not a case of completion, but it is a case of keeping them in repair. Only in one case the tank was incomplete and that was completed by a *malguzar* by *takavi*.

210. Q. Why should not that be done by Government, the whole of the wet revenue being taken by Government?—Cholera broke out and he finished it. In regard to other tanks my complaint is that *malguzars* do not keep them in repair.

211. Q. I am talking of tanks constructed by Government. Seeing that *malguzars* neglect to repair their own tanks, is it advisable to hand over the maintenance of these tanks to them?—I do not think that at present we are qualified to undertake the maintenance of a number of tanks which might run to hundreds scattered all over the place.

212. Q. Do you mean on account of want of establishment?—Yes, and also knowledge. We are only groping in the dark. We do not know how much water is required per acre of rice. We have more industry and more resources than the *malguzar*, but we do not know anything about cultivation. It is rather a big thing to undertake the maintenance of so many tanks.

213. Q. You have said in reply to Mr. Higham's question that you introduced a new provision into the *Wajib-ul-arz* to the effect that the *malguzars* shall collect only dry rents and not wet rent if they fail to keep the tank in repair. Is there any authority for introducing that new provision?—It was sanctioned.

(Mr. Craddock.)—It is included in the new Tenancy Act.

(Witness.)—Is that so? There was no authority then, but it struck me as reasonable to introduce the new provision. I found *malguzars* collecting rent at the irrigated rate though they failed to keep the tanks in repair. They were absentee *malguzars* and they did nothing to repair the tanks and yet they collected rent at the irrigated rate. I sent up a proposal that they should be allowed to collect rent only at the dry rate if they failed to repair the tanks, and this was sanctioned.

(Mr. Rajaratna Mudaliar.)—In the case of tanks—I am repeating the question put by Mr. Mackenzie in other places—should not the Government contribute a portion of the cost of repairs, seeing that it derives a share of the wet revenue?—I am afraid I do not understand exactly. On what grounds should they contribute? Is it because they get revenue?

214. Q. Yes. A portion of the wet revenue goes to Government and a portion to the *malguzar*?—Similarly the Government gets a portion of the revenue due from manure lands which lie near the village sites and which get extra drainage.

215. Q. But there is no question of private expenditure. These tanks were constructed by the *malguzars*?—We give exemption in these Provinces up to the second settlement. In addition to that why should we pay for the upkeep?

216. Q. Do you not think it is fair to do so?—I do not see any reason why we should. We tax improve-

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ments only after two settlements. If we are to do anything at all, we might give a longer period of exemption.

(Mr. Muir-Mackenzie.)—That only applies to new tanks. But what about existing tanks?—I think we might legitimately contribute something in the way he suggests by way of inducement. But I do not think that we can admit, as a principle, that we are bound to take a share of the expenditure in the maintenance of these tanks.

(Mr. Rajaratna Mudaliar.)—What is the feeling amongst malguzars as regards repairs to tanks. Would not their self-interest induce them to keep them in order?—The more provident among them did construct splendid tanks and maintained them. But they have been allowed to go out of repair, because they have been succeeded by negligent malguzars.

217. Q. There may be bad specimens. But taking them as a class, are you in a position to say that they derive much profit from irrigation under these tanks?—The profit derived is not much, save in the case of their own cultivation. When I was in Balaghat, before either of the famines, it was considered a luxury to build a tank. But they would not borrow money for it; since the famine the view has been changed.

(The President.)—The more prudent among them are beginning to see the necessity for a tank?—Yes. They are beginning to see the grave risk they run by leaving the tanks unimproved.

(Mr. Rajaratna Mudaliar.)—If more money were spent upon improving the capacity of tanks, the tenants would be prepared to pay an adequate water rate?—They tell me that they would pay. I asked them in many villages. They offered 12 annas.

218. Q. That is the highest offer. Some offered 4 annas and the others 12?—They are actually paying 11 annas for irrigated land of the best kind—in addition to the rate they are paying for the land that is not irrigated.

219. Q. In Seoni district the total area shows a decrease of about 100,000 acres during the past ten years?—Our agricultural statistics are necessarily fallible. May I see what the areas are? [Mr. Sly's statement was handed to the witness.]

(Mr. Muir-Mackenzie.)—I dare say you could say whether the area has very largely decreased?

(Mr. Rajaratna Mudaliar.)—The figures are given on page 39 of the appendix. You will find that the total of *kharif* and *rabi* area declined from 725,660 acres to 628,391?—I see it has been steadily on the decline for the past few years.

220. Q. Is there any special reason for the decrease?—Rust on wheat, bad seasons, and the effects of two famines. It will be very nearly up to the normal this year.

221. Q. The decrease is almost entirely in the *rabi* area. Do you think it is due to rust?—This year the part that shows the most decrease is the deteriorated part of the rice tract—the Ugli tract.

222. Q. In Balaghat there has been no decrease in cultivation?—I found it a desert when I went there two years ago. Balaghat area don't show a decrease, because they include what are called the Utera areas which may be great in certain years but not in others.

223. Q. As regards Seoni you think it is due partly to rust and partly to famine?—Yes. Distress began with the failure of *rabi* and went on to the two famines.

(Mr. Craddock.)—When you said that the *rabi* crops did not suffer much in the famine, I suppose you were referring particularly to the Seoni district?—I hardly knew what went on outside. I was too busy to know it. I was referring to the richer tracts of Seoni only.

224. Q. There was a great reduction in the area?—Yes.

225. Q. Very largely due to the land being hard and so on?—Yes. The reduction was in Lakhnadon Tahsil.

226. Q. But the outturn was saved by rains in the cold weather?—Yes. In the south, as they have done this year. If land is properly prepared it gives a good crop even without rain. We have had no rains this year. That is only in the richer part but not in poor villages.

227. Q. That is the *haveli* and the part in the Ner-budda valley which is hunded?—They did very well—the *haveli* and the Ghansore tracts in Seoni.

228. Q. That is not very low land?—Yes.

229. Q. To return to another subject. As regards village tanks how have you recorded them in the *Wajib-ul-arz*? Have you got any irrigation list to show what fields are irrigated by what tanks?—I have got it for Balaghat. I have asked for a similar list for Seoni, but they have not yet prepared it.

230. Q. In a majority of cases the malguzar has the first claim. That is to say, the tenants can only get water when there is some to spare, and poorer irrigation is chiefly to be found in the tenant's land?—Yes. The difference is in the number of waterings. The malguzar will take three-waterings while the tenant will get only one.

231. Q. Does not that affect the irrigation rent, the extra rent which the tenants have to pay on the irrigated land?—For their best fields they only pay 11 annas extra.

232. Q. These are the standard rates which you have adopted, considering the irrigation rates generally paid by tenants?—I have arrived at it by taking certain factors from which the rents had been deduced.

233. Q. You have had to give weight to the fact that most of the irrigation done by ryots is somewhat inferior?—There is also the other case. There are a good many tenants whose fields are below the tanks and which ought to get good irrigation.

234. Q. In arriving at the factors for fixing the rates for a village, you have had to pay consideration to the fact that irrigation which the tenants got was generally inferior to what the malguzars got?—I dare say allowance is made.

235. Q. Therefore you could not deduce from these rents what people would pay for regular irrigation, supposing they had it from a Government reservoir?—Perhaps not.

236. Q. How many rupees an acre could you get by giving good irrigation, giving as many waterings as may be required, to a field which does not get water now?—It would not be much. The fields that now get water scantily are to be irrigated by these big tanks. But the land to be so irrigated consist of high-lying lands and tops of ridges which are rather a poor soil and which, however well irrigated, are not likely to pay a heavy rate.

237. Q. But the yield is increased by a greater proportion?—May be. They may go up to a rupee.

238. Q. But if you could grow double crop, you could get a higher rate?—Yes.

239. Q. How many rupees do you think irrigation would add to the produce—Rs. 5 or 10?—I think I would put it down roughly to Rs. 5 an acre.

240. Q. Don't you think that if the people in the course of years found out that they got Rs. 5 an acre by getting this water, they would not pay Rs. 2 out of 5 if Government said to them: "We are going to stop your water"?—Not for some time at least. They might in course of time. But there is a large class of tenants who are not keen in having the best class of lands irrigated. The demand for irrigation for the best land would not be high as compared with that for poor land.

241. Q. If you gave water for 2 or 3 years, they would learn its advantages better?—Yes. They have been learning dry methods of cultivation from generations. They will find it very difficult to change them now.

242. Q. In filling existing tanks you could not quite see how the malguzars would pay for it. But in filling these tanks there is a saving of revenue which you would otherwise have to suspend. I mean to say that if the tank is not filled and you filled it, would you not save some part of the revenue?—You mean the revenue from irrigated land? Are you making any difference between filling tanks and irrigating fields directly?

243. Q. It has been suggested that from big tanks you might fill the existing tanks and allow the malguzar to take the water whenever he wanted it and pay for it. You are doubtful whether the malguzar would pay for it. In some places it was given in evidence that they would pay?—They would not pay for water.

244. Q. But you would get considerable advantage by filling their tanks by the saving of revenue?—The reason why I think they would not pay is because they would have to pay for irrigation direct.

245. Q. The idea was you irrigate their fields through existing tanks?—The tanks are in low ground and are intended mainly to irrigate their home-farm. They are not intended to irrigate the whole village.

- Mr. 246. Q. If you irrigate a part of the village and fill
A. Mayne. the tanks they will pay for it?—Yes.
- 17 Mar. 02. 247. Q. You will get a saving in revenue also?—
Yes.
248. Q. There is a good deal of the area in a normal

year returned as wet land unirrigated. Is it unirrigated because they have not got water to irrigate it or is it because the lands are so good that they do not want water?—Mainly because they have not got water.

WITNESS No. 32.—RAO BAHADUR DADU GULAB SINGH, Malguzar of Seoni.

Rao
Bahadur
Dadu
Gulab
Singh.

To Mr. Craddock.—I am Malguzar of Seoni. The cultivators irrigate in my villages. The tanks in my villages were made by me and my fore-fathers. I water my own lands from my tanks and when urgently needed some water is given to cultivators. I repair my own tank, through the cultivators' help sometimes. In some places Rs. 2 per khandi of seed sown is charged for water. I have not spent any funds on land improvement this year. I have spent Rs. 1,600 of *takavi* on land improvements in former years and also some private funds. I am prepared to spend more funds on land improvements on some at my villages where they are needed. The tanks made by the State

should be repaired by malguzars. I have two in my villages, I have done no repairs to them. In one of my villages, the Thekadar has not repaired the tank. If he does not do the repairs I will. The increase in yield due to irrigation will be 25 per cent. On irrigated land the yield is as much as ten-fold for the seed, that is, one khandi will give ten khandis, a khandi of seed is sown on 2½ acres. When there is good rainfall there is no need for irrigation except to the heavy classes of rice. The profit per acre due to irrigation will be about Rs. 5 or Rs. 6 per acre. In 2 or 3 years, the people will have the benefits of irrigation and then they will pay good water rates.

WITNESS No. 33.—MR. W. N. MAW, I.C.S., Deputy Commissioner, Damoh.
Replies to printed questions.

A.—GENERAL.

- Mr. 1. Q. To the district of Damoh. I have officiated
W. N. Maw. as Deputy Commissioner for the last two years.

16 Mar. 02. 3. Q. (1) The district is not thickly populated, but on the other hand there is no such sparsity of population as to form an obstacle to the extension of irrigation.

(2) And the number of cattle is quite sufficient for the cultivation of irrigated land.

(3) Manure is principally used in the hilly or rice-bearing tracts, where the number of cattle is, owing to better facilities for grazing, greater than in wheat-growing tracts. The supply would be sufficient for irrigated land.

(4) The *haveli* or wheat-growing country lies north of Damoh, and in it there is a great deal of black cotton soil, but malguzars in the *haveli* are of opinion that the outturn of wheat would be doubled if systematic irrigation were introduced. The light soil in the hilly parts of the district is without question suited to irrigation.

(5) The seasons for the last 10 years have been abnormal, and famines have been caused by the too early cessation of the rains. Rust has frequently been caused by too much rain in the months from November to February. The uncertainty of the supply of water is a reason for extending irrigation in the rice-growing tracts, because in normal years the irrigation of rice would do no good. The late commencement of the rains is a factor of no importance so long as the rains continue late enough for the *kharif* crops to ripen. The early cessation of the rains in any year would be an additional reason for extending irrigation to the *rabi* crops. In normal years the outturn would be doubled by irrigation, while in years of early cessation of the rains, this proportion would be greatly increased, and in some cases the crops would be saved from withering altogether.

(6) Owing to the last 10 bad years there is a great lack of capital in the district, and this would prevent cultivators from making tanks or digging wells without assistance from Government, however clearly the advantages of irrigation were realized by them.

(7) I do not think that the fear of enhanced rent or revenue assessment would form any great obstacle to extending irrigation if the people were in better circumstances.

(8) This would be no obstacle. The people know little about the Tenancy Law, but their tenure is well guarded in all cases.

(9) I know of none except the general ignorance of the people concerning the methods of irrigation and their unwillingness to do anything their fathers did not do before them.

5. Q. The people are willing to take as much money in Land Improvement Loans as is offered to them; but they spend it in embanking fields for *rabi* cultivation, and not for making tanks or wells. Systematic irrigation of *rabi* crops from wells is not practised in the district, and if it were decided to make a serious effort to introduce it, it would not, in my opinion, be sufficient merely to reduce the rate of interest, which is already sufficiently low. It would be best as an experiment to offer loans for the construction of

tanks and wells without interest and repayable over a long series of years (say 5 to 15). The usual period allowed for repayment at present in the case of small loans is 3 years. If this were extended, and the loans granted without interest, hundreds of applications would be made for them, and it would be unnecessary to offer a partial remission of the advance, which, in my opinion, would only cause a useless waste of public money. But in the case of loans for digging wells, if the attempt to obtain water failed, I think it would be only fair to the borrower that the loan should be remitted. It is improbable, however, that the knowledge of this condition would have much effect in increasing the number of applications for loans, because cultivators as a rule know where water is to be found.

Grants-in-aid would, I think, be insufficient to stimulate the extension of irrigation. The cultivating classes are at present so unaccustomed to irrigation that it would require more than the expectation of a grant-in-aid on the completion of the work to make them invest their money on irrigation projects.

6. Q. There is no fear that cultivators would leave their holdings to go to irrigated tracts. The difficulty would be all the other way, that is, to get them to take to irrigation at all. They at present evince not the slightest desire to have irrigation extended to them.

D.—TANKS.

23. Q. (1) The water flows in naturally from the catchment area without any artificial channels or ditches.

(2) The embankment is cut and the water allowed to flow out on to the rice crops in years of drought. I know of no irrigation of *rabi* crops from tanks.

(3) There is no ordinary irrigation, and it is impossible to say how long the periods are. The question seems to refer to irrigation of wheat from tanks. I know of no irrigation of *rabi* crops from tanks in the district.

(4) About 20 acres of rice land.

24. Q. (1) In the *haveli*, even if irrigation were practised, very little increase in the area double-cropped would occur, as most of the land is at present kept for *rabi* cultivation, and the principal object of irrigation would be to increase the outturn of this crop. In the hilly portion of the district irrigation would render double-cropping practicable on *mund* soil, but the area affected would be very small.

(2) It would be possible to sow "anterbed" rice over larger areas, in substitution of the ordinary varieties.

(3) From local enquiries which I have made it seems to me probable that the outturn would be increased as follows:—

(a) In a year of ample rainfall—

Rice No increase.

Rabi crops By 50 per cent.

(b) In a year of scanty rainfall—

Rice By 50 per cent.

Rabi crops Double the outturn.

while in a year of absolute drought full crops might

be obtained with irrigation, whereas nothing would be produced without.

25 to 31, and 33. Q.—There is practically no irrigation from tanks in the district. Rice fields are occasionally irrigated by opening the bunds of tanks, but I know of no irrigation of *rabi* crops from tanks.

32. Q. I do not think private persons would take to irrigation from tanks until they have been taught the benefits of irrigation. This could best be done by Government undertaking the nine projects which have been elaborated by the Public Works Department for this district. At one village (Marankhera) is a continual flow of water leaking from a tank and running down to some *rabi* fields, but the cultivators have carefully diverted the water from their land, and say that irrigation would damage the crops because the moisture would produce insects in the ground which would destroy the roots of the young plants.

E.—WELLS.

34. Q. There is practically no irrigation from wells, and the few facts which I have gathered on the subjects apply generally to the whole of the district—

(1) From 20 feet to 40 feet.

(2) The supply is usually from springs. The water only becomes sature near to village sites, and even then it seldom becomes too saline for use.

(3) From Rs. 200 to Rs. 300.

1. Q. (The President.)—You are in charge of Damoh district?—Yes.

2. Q. Where were you before you went there?—I was the Commissioner of Excise for nine months before that. Before that I was in Mandla District.

3. Q. Had you famine experience?—Yes. In Mandla and Jubbulpore, when I was Assistant Commissioner.

4. Q. You say in reply to sub-question 4 of question 3, "The *haveli* or wheat-growing country lies north of Damoh, and in it there is a great deal of black cotton soil, but *malguzars* in the *haveli* are of opinion that the outturn of wheat could be doubled if systematic irrigation were introduced." Do you mean irrigation upon black cotton soil?—Yes.

5. Q. That is the general feeling in regard to that soil?—That is the opinion of *malguzars*. Mr. Harriott enquired of *malguzars* about it, and they told him exactly the same thing in other districts as they told me in Damoh.

6. Q. Do you know if the soil is of the same nature as in Hoshangabad and Narsinghpur or elsewhere in the Nerbudda Valley?—I do not know.

7. Q. We have heard from some witnesses that it is not only useless but it is downright prejudicial to wheat to give irrigation to black cotton soil. I should like to find out why it succeeds in one place and not in another?—The best soil for it is *Kabar* and the next best is *Mund*. Crops suffer in the cold weather, if they do not get rain at Christmas.

8. Q. You say in reply to question 5, "The people are willing to take as much money in Land Improvement Loans as is offered to them; but they spend it in embanking fields for *rabi* cultivation, and not for making tanks on wells." How did the embanked fields do in famine time?—The outturn in them was fairly good. The crops were saved for the most part.

9. Q. In the famine of 1899 there was very little unirrigated wheat which came out successfully?—*Rabi* crop was fairly good in 1899, and wheat was about 10 annas.

10. Q. Unirrigated wheat?—Yes.

11. Q. How did it get the start. There were no late rains in 1899. How did they sow their *rabi* crop?—I do not know what the rain was exactly like in September and October. I joined the district in January 1900, and at that time the soil contained a good deal of moisture, much more than would have been anticipated. Crops were fairly good and the outturn was about 10 annas.

12. Q. I think our statistics show that the later rains of 1899 were a total failure. That is why the tanks came to such a grief. I should have thought that wheat would have required some moisture anyhow before it was sown. But you say "Systematic irrigation of *rabi* crops from wells is not practised in the district, and if it were decided to make a serious effort to introduce it, it would not, in my opi-

(4) The well should be cleaned once in every 8 years, and with ordinary repairs it will last indefinitely. Mr. W. N. Maw.

(5) By a mot; but in a village, Koopi, in the north of the district, Persian wheels for the irrigation of barley (*jawa*) are in very general use. Formerly wheat was grown in this village, but as it was so frequently damaged by rust, barley is now grown instead. The water is drawn from the banks of a stream. Persian wheels are also used for *baris* and market gardens near Patharia. 16 Mar. 02.

(6) 4 or 5 acres.

38. Q. Rock is frequently encountered in digging wells, which has to be blasted with gunpowder. No assistance, such as that referred to, has ever been offered by Government or Local Bodies. I do not think it would be of much use. As a rule water is found all over the district, and there is no difficulty about constructing the wells.

39. Q. I do not think that any scheme for digging wells on private property would bear results at all comparable with the outlay which would be involved. If any money is to be spent in the district on irrigation, I would recommend the construction of a few really good tanks.

40. Q. The water-level is too low to admit of temporary wells being sunk to any great extent in a year of drought. They are not commonly used in Damoh District.

nion, be sufficient merely to reduce the rate of interest." That is as regards loans?—Yes.

13. Q. Is there no well irrigation?—Practically none. There are about 1,000 wells irrigating about 1,600 acres.

14. Q. Are they not in the hands of the *Kachias*?—Yes.

15. Q. They irrigate garden crops and vegetables?—Yes.

16. Q. Do you know how these wells behaved in the famine?—Did they hold out or not?—Oh! yes, they held out for the most part.

17. Q. Have you any opinion as to why it is they care so little about well irrigation which is enormously practised in other parts of the country; is it due to want of energy or go or want of cattle?—I think it pays them better to reclaim fallow land and cultivate it than to improve the present cultivation.

18. Q. Is there much fallow land to be reclaimed?—About one-third of the occupied area is fallow.

19. Q. You go on to say, "It would be best as an experiment to offer loans for the construction of tanks and wells without interest, and repayable over a long series of years (say 5 to 15)." Would it not be equally good to require these series of years doubled. Suppose a man is required to repay a loan in 30 years instead of 15, and to pay the interest in the mean time, would it not be equally good?—If you give him a sufficiently long period, he would repay it. I do not think the question of interest makes much difference.

20. Q. As a matter of fact you are not pressed by people coming and asking for loans?—No; they have got into the habit of thinking that if loans are to be given, we shall go out and distribute them in the villages. That is what was done in the famine.

21. Q. Do you think that if you ask the Sub-Divisional Officers and the *Tahsildars* to go out and give loans, you could disburse a large amount?—Yes; we could give large amounts, but we could not recover them afterwards.

22. Q. You mean the security would not be good?—They would be too poor to repay. Many have already taken *takavi* which they have not repaid, and the rest are for the most part too poor to receive loans.

23. Q. As regards tanks, is there a considerable amount of rice cultivation unirrigated?—Mostly unirrigated.

24. Q. You say in reply to paragraph (2) of question 23, "The embankment is cut and the water allowed to flow out on to the nice crops in years of drought." So in years of plenty of rain the tanks are not drawn upon at all?—No.

25. Q. In reply to question 32, you allude to the nine projects elaborated by the Public Works Department for this district. Have you gone into these?—Yes.

Mr. W. N. Maw. 26. Q. Are there any of them that you would specially like to back up?—They are very expensive, and I would not recommend any of them. I think the cost of construction would go up to Rs. 100 per acre irrigated, which is very high. None of the projects are for irrigating more than 500 or 700 acres, and they cost from Rs. 50,000 to one lakh.

27. Q. It is high. Have you any suggestion to offer to otherwise protect the district against famine from which it suffers somewhat severely?—Yes, I would recommend small tanks in the hilly portions of the district and embankments to rabi fields in the *haveli*.

28. Q. I do not know what those nine projects are. Are they big tanks?—Yes. They are very costly. They irrigate not more than 700 acres each.

29. Q. Do you think that small tanks in hill portions would be cheaper per acre?—Yes; they would be done by malguzars if we give them *takavi*.

30. Q. Not as Government tanks?—Government would not do them if they were too small.

31. Q. Is there any reason why you should not give *takavi* for these works?—*Takavi* might be given to these works with advantage. We shall have to be careful in granting loans if we want to recover them afterwards. I do not think I could give more than Rs. 5,000 or Rs. 10,000 to reliable malguzars who would repay them.

32. Q. You would tie them down to maintain them?—I do not think we need bother them. It is their own interest to do it.

33. Q. From all accounts they evidently do not do that. You have absentee landholders and things of that sort?—I do not think that a landlord would take a loan unless he intended to maintain the tank. If he does not keep it up, it is his own loss.

34. Q. And you yourself do not recommend any of these nine projects?—I would not now.

35. Q. Because you think that they are too costly, considering the extent of the area irrigated by them?—Yes.

(Mr. Higham.)—I understand you recommend irrigation to wheat cultivation?—In regard to wheat area, I recommend that we should encourage the embanking of fields. Embankments are more suitable and much cheaper than tanks.

36. Q. For rice you would make tanks?—Small tanks would be very useful and would be constructed by malguzars. It would be too small a work for Government to make tanks costing about Rs. 1,000 each and irrigating about 50 acres.

37. Q. Would malguzars construct them?—In a few cases they would, but as a rule they would not.

38. Q. What inducements should be offered to them?—I would give them a long period for repayment, about 15 years, and they would have money by that time and we should be able to collect it.

39. Q. To repay within 15 years with usual interest?—Yes.

40. Q. Then the Government would not make any tanks in the district?—I would not recommend any.

41. Q. Why?—Because we have not come across a sufficiently good project.

42. Q. Have you any proposal to make for constructing these village tanks? Have you any scheme?—No scheme is necessary except simply to offer money on *takavi*. There are plenty of people that are willing to take it.

43. Q. You will depend on malguzars for schemes and you would recommend that they be granted loans as they come forward?—I think it would be necessary first to see how many fields belonging to tenants would be irrigated from tanks and to safeguard the rights of tenants in taking water from them.

44. Q. Are the malguzars showing any desire to come forward in that way?—Not at all. But if *takavi* were offered, I have no doubt that a lot of them would come forward to take loans.

(The President.)—And to carry out the work?—Yes. They will have to. If not how can the work be made otherwise?

(Mr. Higham.)—Are there any malguzars who have projects in their mind's eye that they would like to carry out? Are they really keen on tanks?—No, not at present.

45. Q. Suppose you are to have a famine in the district and you are required to open relief works, could you employ labourers in making village tanks in the rice tracts?—Yes.

46. Q. How would you go to work to begin with?—In the last famine we made 12 tanks, and had plenty of time to select sites before distress became acute.

47. Q. Have you any programme?—As a matter of fact you can make a tank in almost any village.

48. Q. It does not require any selection?—I myself selected four sites with the Assistant Commissioner in one morning and the tanks were subsequently all constructed. They are very good tanks.

49. Q. No difficulty about sites?—No.

50. Q. You say they cost about Rs. 5,000?—Yes. These tanks cost five or six thousand rupees. But a malguzar could do it much more cheaply. If he took a loan of Rs. 1,000 he might add to it something out of his pocket, and with it he might make a small tank which would irrigate 50 acres or a little less than that.

51. Q. If the malguzar made a tank, would he have any land to irrigate?—Yes, only the richest malguzars would go in for it.

52. Q. Would they take loans for making tanks which would irrigate a part of their own land and the rest of the land of the tenants?—No.

53. Q. The tenants would not pay for the water?—No. They are quite unfamiliar with that idea in Damoh. If you introduced that idea, they would not take the water.

54. Q. Still less would the malguzar make a tank which would serve more than one village?—There are very few cases in which the site would be useful for two villages. But if a tank is to serve another village, the malguzar would not construct it unless the other village belonged to him.

55. Q. Then the only chance of getting irrigation tanks of a suitable character in Damoh district lies in the malguzars who are well off and who would make tanks for the irrigation of their own lands?—Yes.

56. Q. You cannot accept anything outside that from malguzars?—No.

57. Q. And it is not worthwhile Government doing them?—No.

58. Q. That would not give an extensive programme?—No, a very scanty one.

59. Q. I suppose a great deal can be done in *haveli* districts in making bunds?—A great deal.

60. Q. That you would do by *takavi* advances?—Yes.

61. Q. Would people come forward very willingly?—There would be no difficulty in getting rid of Rs. 10,000 a year for embankments.

62. Q. On what terms will these advances be made?—They are generally given in instalments from three to eight years, and the interest is 6½ per cent.

63. Q. What have you been spending in the shape of these advances?—The famine distribution had been so very heavy at one time that there were five lakhs outstanding in the district. But now it is only two lakhs. But in an ordinary year about Rs. 5,000 would be put down in the estimate under the Land Improvement Loans Act.

64. Q. Would they take more if more liberal terms were given?—If you give more liberal terms the more will they be willing to take. If you charge no interest, you will get more applications.

65. Q. Suppose you were to propose to have the money repaid, with interest, within 15 years. At present loans run to four or five years?—Yes; sometimes eight years. If you make it payable within 15 years, you will get a larger number of applications, and I should probably be able to get rid of at least Rs. 10,000.

(The President.)—There is no reason why you should not prolong it for 15 years?—No, except that *takavi* is usually given to reliable malguzars who can repay it within five years.

(Mr. Higham.)—Have you any idea as to what areas may be said to be protected if Rs. 10,000 is spent on making embankment.

(The President.)—We had it in evidence yesterday—30 to 40 rupees to the acre.

(Mr. Higham.)—Have you ever thought of it in that way?—I think it is less than Rs. 20; either 20 or less.

(Mr. Craddock.)—The five lakhs that you were speaking about was seed *takavi*?—Yes.

(Mr. Higham.)—Your Rs. 10,000 would protect 300 or 400 acres?—Yes.

66. Q. Have you a programme now of relief works that could be put into force in case of a famine?—

No; we have not one at present, but it is being made. We are examining the whole district—all the villages of the district; but the programme is not ready.

67. Q. Will you put into that programme the villages in which you would construct tanks?—We are putting in those villages.

68. Q. Who are to select the sites?—The work is first of all done by the Tahsildar and afterwards it is checked by me on the spot.

(Mr. Muir-Mackenzie.)—Can you expect to construct a tank in every village?—You can get a small tank in almost every village.

69. Q. I mean as famine relief work?—No. By no means. We could get one in about five villages.

70. Q. How many villages are there altogether?—About 1,400.

71. Q. Will you be able to visit all these villages yourself?—When the list is ready for one Revenue Inspector's circle, I will tour round it. I cannot visit all the villages, but I can see some of them and make enquiries about the rest.

72. Q. Don't you think it would be better to have the site selected by skilled professional men?—Yes.

73. Q. You say that you made 12 tanks in the famine?—Yes.

74. Q. How many acres do they irrigate roughly?—About 1,200 acres. Six were irrigation tanks and six were not.

75. Q. These six irrigation tanks irrigate 1,200 acres?—Yes.

76. Q. Is it all irrigated since?—They did not irrigate the lands from the tanks since their construction, because they were labouring under some misapprehension that they were not allowed to use the water.

77. Q. From what do you infer as to the success of the tank?—I have seen the tanks. They fill well and they are on high lands. Rice lands could be irrigated, and the fields just below the tanks are irrigated by percolation.

78. Q. Are the tanks not water-tight?—No. They leak a little.

79. Q. Are they in good repair?—Yes.

80. Q. No fear of their breaching?—All have been repaired.

81. Q. By whom—by Government?—By villagers in every case except one. In that one case the cost came up to Rs. 250 and I had it done by the District Council.

82. Q. Had you to put pressure on the villagers?—The Tahsildar went round and the villagers agreed to repair them. The repairs were of a slight nature; simply to fill up some rifts.

83. Q. I suppose you give over the tanks to them? Would they repair them?—We can easily get them to repair the tanks, but these tanks scarcely require any repair.

(The President.)—As time goes on they will want repairs?—If they require extensive repairs such as the raising of bunds by four or five feet, you cannot expect them to do them.

(Mr. Muir-Mackenzie.)—On what ground do you think that malguzars would take *takavi* seeing that they have not come forward?—They are always willing to take *takavi*.

84. Q. Is it for land improvement or for seed and cattle?—They are always willing to take loans for seed and cattle, but I should not think they would object to take loans for land improvement.

85. Q. In ordinary years the amount advanced had not been very much?—No.

86. Q. If they are willing to take more, why was it not more than Rs. 960 in 1900-1901 was taken. On page 56 of Mr. Sly's statement you will find the figures given relating to the amounts advanced. The sums advanced are very small, and do not inspire very great confidence at the first sight. Do you think that the necessity for taking loans was not made out and that in consequence of their having had very good years they did not feel the pinch?—The real reason was that only the applications that were made were dealt with but no notifications were issued that so much had been allotted for the purpose, and the malguzars were not invited to take loans. If a man applied for a loan, we examined the security and gave the loan. If we wished, we could have got rid of more. We could have sent out notifications, and if this had been done, there is no doubt that malguzars would have

come forward. We made no efforts in the past to get rid of many loans.

87. Q. You cannot get rid of more than Rs. 20,000?—We could get rid of that.

88. Q. You propose 15 years, but you can legally give them 35 years. Why should you not advance loans for the full period of 35 years?—The work to be done is a small one and the malguzars are fairly well-to-do. It seems, therefore, unnecessary to prolong the period for 35 years.

89. Q. If he would like it?—There is no reason why he should not be given 35 years.

90. Q. Do you think there is any chance of people taking money for wells?—I do not think there is any chance at all.

91. Q. Is the district not suited for wells? There are wells which are very deep—20 feet?—20 feet is the minimum.

92. Q. They are not often on the banks of nallas where you may get good sites?—They almost always meet with rock. They have to blast the rock with gunpowder and dynamite and this makes the operation more expensive.

93. Q. On the other hand after you have done that there is not much trouble?—Yes.

94. Q. Once you get through the rock is there much chance of finding water?—You do get water. Sometimes you will have to go down 40 feet; sometimes you find rock down to the bottom. Sometimes there is rock for only 7 or 8 feet. It is quite close to the surface in the hilly portions of the district. If you want wells, you should make them in *haveli* where you would not meet with much rock.

95. Q. You say the embankment would cost Rs. 20 an acre; supposing the Government were to make a lot of embankments, do you think there is any chance of the Government getting any money in the shape of increased assessment—about one rupee an acre?—I think that would be very difficult to work. I do not know how that scheme would work exactly.

96. Q. If Government made tanks, they take a water-rate. In the same way, if they increase the cultivation by making embankments, they should get an increased rate?—You would have to get the people to agree beforehand to pay an increased rate.

97. Q. Possibly or else we may levy it at the next settlement. Do you think it would be possible to put one rupee an acre, at the next settlement, of the increased cultivation?—They would not agree to that.

98. Q. You don't think it would be possible for Government to take up embankments in the same way as they take up tanks?—No.

99. Q. Would you not employ relief labour on embanking?—A very useful thing to employ men on. If that is done I consider it to be a gift to malguzars and tenants.

100. Q. Still it is very useful?—It would be very useful. I don't think there is a better way of utilizing relief labour.

101. Q. No insuperable difficulties of organization?—I don't think so.

102. Q. Have you had much experience in carrying out village works in famine?—Yes, in both famines.

103. Q. How do you do it—by selection?—The way of getting admission to village works was by tickets. The ticket system was a very good one. Tickets were given in villages, and they could not get admission in tanks without these tickets.

104. Q. You might employ a similar system in connection with embankments?—I should prefer the ticket system. The tickets are issued by the Circle Officer of the Revenue Inspector to deserving people.

105. Q. These tanks that you propose to put into the famine programme, are they going to be constructed in your rice tracts?—No. We are going to take up every village in the district.

106. Q. A great many of them are only for water-supply?—Yes.

107. Q. Not irrigation tanks?—No.

108. Q. Are irrigation tanks confined to rice tracts?—Yes. I should confine them to rice tracts.

109. Q. The rest of the district is what—black soil?—Yes.

110. Q. Where the tank irrigation would not be of much use you think?—Generally not.

(Mr. Rajaratna Mudaliar.)—On page 1 in paragraph 3 of the district note by Mr. Harriott, he refers to the remains of an old dam which appears to have been the site of a large reservoir in the past. Do you happen to know the locality?—I know the place.

Mr.
W. N. Maw,
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Mr. W. N. Maw. 111. Q. Is any project proposed in connection with this site?—No; it was simply a shikar tank for Gond Rajas, covering about 20 villages. These are rich villages and all cultivated. Down below this tank there is nothing but jungle. One of the Rajas used to go there for fishing.

112. Q. It is a useless site now?—Yes.

113. Q. You said that one-third of the occupied area is fallow land?—Yes.

114. Q. I believe you grant some reduction of rent on fallow land in this province. Is it not so?—After the settlement of the district the rent was abated two years ago. In villages in which there was a large reduction in cultivation the land revenue was reduced by about Rs. 70,000 I think. That was in the abatement proceedings.

115. Q. How long should the lands have lain fallow to entitle them to this consideration?—This is a special procedure applied to special cases. It is not automatic. It requires special orders, and this procedure is taken when the state of any district requires it.

116. Q. As a rule you don't grant any abatement on fallow land?—No.

(Mr. Craddock.)—Old fallow land is unassessed at the settlement.

(Mr. Rajaratna Mudaliar.)—Old fallow land means land that lay fallow for a few years?

(Mr. Craddock.)—Yes.

(Mr. Muir-Mackenzie.)—I suppose this land has gone out of cultivation on account of famine, for which abatement was given?—Yes.

(Mr. Rajaratna Mudaliar.)—On page 4 of the district note it is stated that 60,000 acres might be protected by embankments or by wells. Do you think it would be possible to protect such an area in Damoh district?—Not practically. It is possible, if the Government undertook to spend money. You can protect the whole wheat area by wells or embankments if you could manage to get the people to work the wells and get them to construct the embankments.

117. Q. In your estimate you put down the area at only 10,000 acres?—That is where I was talking about tanks for the protection of rice lands.

118. Q. In Damoh district the cultivated area has declined during the last ten years from 549,782 acres to 457,986 acres. Was the decrease due to famine entirely or any portion due to rust and other causes?—It is due to continuous bad seasons that we have been having for the last ten years.

(Mr. Craddock.)—There was spread of *kans*?—Yes. Spread of *kans* in *haveli*.

(Mr. Rajaratna Mudaliar.)—In the *rabi* area the decrease amounts to 152,000 acres, but there is some increase in *kharif* area?—It is about 130,000 acres in the *rabi* area.

119. Q. I take the first year and the last year. Is that decrease due to the failure of rains or to the growth of this grass?—In the last ten years we have had rust four times. Sometimes we have had cessation of rains which led to the withering of crops. Sometimes we had frost which did a lot of damage. Speaking generally, during the last ten years, the seasons have been unfavourable. All these causes led to the decrease in cultivation.

120. Q. Was there much loss of revenue in consequence of this?—By abatement proceedings the revenue was reduced by Rs. 70,000. That is a permanent reduction till the next settlement.

(Mr. Muir-Mackenzie.)—Which expires when?—In about 4 years.

(Mr. Rajaratna Mudaliar.)—When was the last settlement made?—In 1893 or 1894.

(The President.)—Is not the period 30 years?—No; only 12 years I think.

(Mr. Muir-Mackenzie.)—Was there much increase of cultivation even at the last settlement?—I do not know.

(Mr. Craddock.)—You have said a good deal about the advantages of irrigation of wheat. You say that *malguzars* informed you and Mr. Harriott that the yield would be much increased. Did they ever put this to the test?—Only small areas of wheat are irrigated by *Kachis*.

121. Q. As subsidiary to their garden crops?—Yes.

122. Q. Does the wheat cultivator irrigate wheat much by wells?—In one village there was a considerable area of wheat that was irrigated together with garden crops.

123. Q. Do you think it is spreading?—No.

124. Q. What is the reason for its not spreading?—Because this irrigation is only by *Kachis*.

125. Q. Is not the ordinary Kurmi or the Lodi cultivator taking it up?—No.

126. Q. He does not express any desire to do so?—No.

(Mr. Muir-Mackenzie.)—Is he a high class cultivator—Kurmi and Lodi?—The Kurmi is a good cultivator. The Lodi is an extravagant cultivator, and is not as good as the Kurmi.

127. Q. Does he keep his land clean?—The Kurmi is rather supposed to be a good and careful cultivator.

(Mr. Craddock.)—Do you think that the system of *bhandwas* is spreading. It was not always the custom to embank in Damoh in the *haveli*?—I think it is spreading.

128. Q. Has it been advantageous as regards *kans*?—Yes.

129. Q. They find that it kills the *kans*?—Yes.

130. Q. Have they made any big embankments?—Some embankments submerge about 100 acres.

131. Q. You mean that they enclose 100 acres?—Yes.

132. Q. What is their height?—Nearly as high as this room—about 10 or 12 feet.

(Mr. Muir-Mackenzie.)—Do *malguzars* make them?—Yes. There is one under the Court of Wards which cost about Rs. 2,000. The *malguzar* got into debt over it and he had to come under the Court of Wards. That encloses about 100 acres; and the out-turn of those 100 acres is about Rs. 3,000.

(Mr. Craddock.)—In recent dry years, have you had any experience of the difference between the out-turn of the *bhandwas* and the unembanked fields?—There is a great difference.

133. Q. Have you tested it by crop experiment in addition to what people said?—I have not.

134. Q. What is generally considered to be the difference?—I should say about double the outturn.

135. Q. Last year you had rust?—Yes.

136. Q. Did it do damage?—It spread to unembanked fields too, but the damage was not great.

137. Q. You think that the fear of rust would not deter people from embanking. On the whole the advantage would be in favour of the embankment?—Judging simply for the last ten years you would not say that the embanking of fields is a good investment, because there has been rust four times. I do not imagine that is the average at all. Therefore in the long run, in about 100 years, it would pay.

138. Q. Have you got any old embankments?—Yes.

139. Q. So that embanking is not a new idea?—Oh, no. There must be plenty of old embankments.

140. Q. If it has not been deterred by this rust, they apparently think the embankment is a sound method?—There is no doubt about its being a sound method. The profits in ordinary years are enormous where the fields are embanked.

141. Q. Is that the method you would recommend for saving the wheat crop?—Yes.

142. Q. You have 70,000 acres of rice cultivation?—50,000. It has been 70,000, but it may be only 50,000 now.

143. Q. Is the rice that is grown broadcast rice—in black soil or in light soil?—Light soil.

144. Q. It is capable of being irrigated?—Yes.

145. Q. Do they do transplanting at all?—No. They do what is called *machawa*. They puddle out the field and then sow the rice broadcast.

146. Q. This year your crop was not a good one—rice crop?—No.

147. Q. About 8 annas?—About 10 annas.

148. Q. They would have taken more water if you had been able to give it to them?—Yes.

149. Q. Can you not get rice tracts in the hilly portions?—Yes.

150. Q. Are there not tanks in the slopes which would irrigate rice tracts? You said that the Government should not make any tanks?—We have taken out the best sites that we could find. We have got nine projects and each tank would only irrigate 700 acres, which is really a small amount.

151. Q. Are you certain that you have exhausted the projects. They have been examined by the subordinate agency?—These were made out by Mr. Neville, the Executive Engineer of Saugor.

152. Q. Did he have time to discover all?—He has not discovered all. He might find other projects equally good. I mean the cost is so prohibitive.

153. Q. You think there is a possibility, if you get a larger project for your district, of saving its rice crop and increasing its yield. If you get that, it would be a great advantage to the district?—It would be an advantage to one village practically.

154. Q. Are there none of your projects which touch more than one village?—There are projects which do touch 2 or 3 villages, but the total area is very limited.

155. Q. But you get a good large area in a single village. Have you not got any regular rice villages?—In some villages it is entirely rice.

(The President.)—It is all unirrigated?—Yes.

(Mr. Craddock.)—The distress was most severe in rice tracts in 1899?—Yes. In Kumhari.

156. Q. (Mr. Higham.)—What happens to the wells in dry years. Do they get dry?—They last right up to the time they are needed for irrigation. That is up to January and February. They are useful for irrigation. They become dry afterwards in March, April and May.

157. Q. You never attempted to improve them by boring?—No; they have never done it. It is purely an experiment for you to go in for boring.

158. Q. There is absolutely no boring in the district?—No, nor in the adjoining district.

(The President.)—What policy would you recommend Government to take to render your district less liable to sufferings from famine than it was during

the last famine?—In the rice tracts I would recommend small tanks costing about Rs. 1,000 each and irrigating about 50 acres.

159. Q. With reference to these tanks which you say cost about Rs. 1,000 each, do you say that the cost per acre is less than the cost per acre with reference to big tanks. Very often the case is otherwise?—According to figures which we have got for our district, it comes out to be more expensive in regard to big tanks. In regard to small tanks and embankments these should not be done by Government, but should be left to people themselves.

160. Q. If they do not do it, what should be done? Was not much money spent on famine relief last time?—I do not see how we can embank fields for other people.

161. Q. One can encourage it by *takavi* advances?—Yes. That is what I recommend. That is the only thing that can be done.

(Mr. Muir-Mackenzie.)—Did the embanked areas suffer very material loss in other famines?—They suffered a good deal of loss. This year the embanked area was attacked by frost and it was very severely damaged.

162. Q. Can you give me any rough estimate whether while other areas sent two persons to relief works the embanked areas only sent one?—No village works were opened in the *haveli*. There were 12 tanks begun in the rice circle.

163. Q. None in *haveli*?—None at all. Kitchens were started very much later in *haveli*. This is due to the fact that we had a fairly good crop—10-anna *rabi* crop.

Mr.
W. N. Maw,
16 Mar. 02.

SIXTIETH DAY.

Pachmarhi, 19th March 1902.

WITNESS No. 34.—MR. B. JAGANNATH, Assistant Settlement Officer of Nimar.

1. Q. (The President.)—You are the Settlement Officer at Nimar?—Yes.

2. Q. How long have you been in that place?—Five years.

3. Q. Before that what were you doing?—I was the Assistant Settlement Officer in other districts.

4. Q. What district have you had acquaintance with?—Mostly with Nimar.

5. Q. You say you were in other districts?—Yes; I was doing settlement work in Bilaspur district some time ago as also in the Wardha district and Saugor district.

6. Q. During the famine were you in charge of famine relief works?—I was.

7. Q. Where?—In Nimar district.

8. Q. The famine was severe there?—Yes, it was.

9. Q. In the Nimar district you have very little irrigation?—Very little.

10. Q. About how much?—About 2 per cent. of the cultivated area.

11. Q. And I think it is all from wells?—Mostly from wells and very little from tanks.

12. Q. There is only one tank in the district?—Yes.

13. Q. And that contains very little water?—Yes.

14. Q. Since the time of famine have the people shown any eagerness for irrigation, any desire to provide against another drought, should it come on?—Yes. I have noticed that there is a real desire for irrigation to save the crops in times of drought.

15. Q. What form is this desire taking? Are they making many more wells?—Yes. They are.

16. Q. More than they used to do?—Yes.

17. Q. Are *takavi* advances being given out?—They are given out, but not so freely as they ought to be.

18. Q. It is because that people do not apply for them or what is the reason?—The procedure seems to be too complicated. There is also the fear of not being able to pay strictly in time and of the disgrace of being dunned by Government.

19. Q. With your experience of the people in the district, what would you suggest to induce people more readily to avail themselves of loans to make irrigation works?—I would recommend the grant of *takavi* being

made as easily and promptly as possible. In case of failure to get water the whole of the *takavi* advances might be remitted.

20. Q. You see that there must be some enquiries. You cannot give money to every person that comes and asks you for it. You cannot go about with pockets full of rupees and give it to everyone who came and asked you for it. You must have some enquiry?—Some little enquiries there must be, but not too elaborate.

21. Q. Are they too elaborate now?—The impression generally is that they are.

22. Q. Are there not any written instructions about giving *takavi*?—Yes, there are.

23. Q. Are these very elaborate?—I think they are elaborate for the district, because it is still in a backward state and not so well advanced as other districts are.

24. Q. Practically how long does it take for a man, who wants, say, Rs. 300 for a well, to get it. Could he get it in a month?—I don't think that he could get it so early as that. It will take about two or three months.

25. Q. And you think it might be given quicker if they like?—Yes.

26. Q. Is it that the Tahsildar is too busy with other things or what is the reason?—There is no doubt that the Tahsildar is busy with a good many other things entrusted to him.

27. Q. Do you object to the rate of interest that is paid?—No.

28. Q. It is not too high?—Not too high.

29. Q. Do you object to the length of time that is allowed for repaying the loan?—No.

30. Q. How much time is generally allowed?—Between 2 and 3 years.

31. Q. That is a very short time. The law allows much longer time?—Yes. The people's desire is that it should be extended to 5 years.

32. Q. It is in the hands of the Deputy Commissioner?—He could at least recommend it.

33. Q. So that there ought to be no difficulty about it?—Yes.

Mr. B.
Jagannath.
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Mr. B. 34. Q. When do they begin to repay the loan?—As
Jagannath. soon as they are able to dispose of their agricultural
produce.

19 Mar. 02. 35. Q. Do they begin to repay it before the well is fin-
ished?—Yes, sometimes. That is why they feel it
most.

36. Q. Are they obliged to do that?—Does the law
insist that they should pay from the time that they
get their first crop?

37. Q. (Mr. Craddock).—They are not required to
pay before 3 years.

38. Q. (The President).—Within 3 years the man
ought to have made his well?—Yes. But in some
places, difficulty has been experienced in repaying the
loan—that is in places where there is trap rock and
they do not get water at a reasonable depth.

39. Q. Altogether they do not take very much
money?—No.

40. Q. What would you do to induce them to take
more loans? Would you publish a notice? Is it the
fear of repaying them so quickly or is it the delay in
getting the advances, that makes them take these
loans not freely?—The great point is that they are
afraid of the money being recovered strictly within
time.

41. Q. Would you recommend that the Deputy Com-
missioner should have the authority sometimes to post-
pone the repayment?—Yes, I would recommend it.

42. Q. You think that it would be a good plan?—Yes.
That will be the best plan. If they are assured that
they would be allowed time in bad years for repay-
ment, they would gladly avail themselves of *takavi*.

43. Q. About how deep are the wells?—About 25
feet in Khandwa *tahsil* and 54 feet in Burhanpur.

44. Q. Do these wells hold out throughout the famine
years?—In years of scanty rainfall they tend to dry.

45. Q. Do you know whether they made experiments
in boring down inside them, to make them deeper?—
No, not to my knowledge.

46. Q. In other districts that you have served in,
where there are tanks and wells, which do you think
will run dry sooner in a bad year—tanks or wells?—
Tanks. There are good many tanks in Chhattisgarh
country.

47. Q. But very few wells?—Yes.

48. Q. You have got black cotton soil in the Nimar
district. Have you not?—No. The proportion is very
small. It is the medium soil that you have there.

49. Q. Do they irrigate their wheat?—They do.

50. Q. Altogether from wells?—Yes, except in one
tract—Kanapur-Beria in the north-west of the district
where they irrigate from a tank.

51. Q. Do they take *takavi* advances for new wells?
—No. They are not accustomed to it.

52. Q. They are accustomed to irrigate?—Yes.

53. Q. Would they irrigate from tanks if the Govern-
ment were to make some tanks for them?—Yes.
There is no great harm in it, but it is not justified by
the existing agricultural practice.

54. Q. You say that they have had a lesson from the
last famine which has been a terrible lesson?—No
doubt they have had a serious lesson. They would
welcome any scheme that would tend to the making
of wells. They really have no idea as to what a tank
means and what the advantages resulting from it are.

55. Q. How many wells are there—several thou-
sands?—About 3,000, a little more than 3,000.

56. Q. And they irrigate about 4 acres apiece?—Yes;
sometimes the area is less than 4 and sometimes more,
according to the quality of the soil; but it is never
more than 8 acres.

57. Q. Do you think that 10,000 or 12,000 acres can
be irrigated by them?—Yes.

58. Q. Of course it is a small area. Do you think
that the number of wells could be doubled if *takavi*
were given freely?—Tribled, I think.

59. Q. Do you think that people would be willing to
take it?—Quite willing.

60. Q. Do you think it would be a good plan to have
a special officer attached to the district to do nothing
else but to attend to *takavi*, to take money into vil-
lages and to give it freely?—Yes. At present wells are
sunk by ordinary wanderers, who are not experts. If
these people are trained by the Public Works Depart-
ment in improved methods of well-sinking, particu-
larly in the use of dynamite blasting, it would be a
good thing; or the Government may supply trained
well-sinkers at moderate cost, as they would be use-
ful in cases where water is not ordinarily reached.

61. Q. Do you think that would be acceptable to the
people?—The cultivators of Nimar are intelligent and
would not distrust Government well-sinkers.

62. Q. I am not quite sure if it is very easy for
Government to get them. What our Commission has
to enquire about is protection against famine. Ten
or twelve thousand acres is not very much of a pro-
tection in a district like yours. We want far more.
Don't you think that if the natives would appreciate
tanks as is done in other parts of India, a greater
area could be irrigated?—Yes; but it will take some
years.

63. Q. What is the kharif cultivation in Nimar?—
Juar and cotton. Cotton is a very great inducement
owing to the very large increase in the number of
mills, gins, and factories.

64. Q. Is there much rust?—Very little. It is very
insignificant.

65. Q. You say you had no black cotton soil to
speak of?—The proportion is not more than 10 per
cent. The prevailing soil is *mal*, medium soil, which
is best suited for the construction of wells while *sandy*
and rocky soils are unsuited.

66. Q. (Mr. Higham).—If a man makes a well in
Nimar, no enhanced rate is imposed till after the
second settlement?—Yes. That area is exempted.

67. Q. It will be exempted for the whole settle-
ment?—For the whole term of the next settlement.

68. Q. Do people know that?—Yes. They do not
entertain any fear on this score, because during the
last 3 settlements, the water-rate had been lowered.

69. Q. Suppose a man has very large holding, would
you only exempt the area, that a well would irrigate,
from enhancement of assessment?—Yes.

70. Q. But on the rest of the holding, the revenue
might be enhanced?—Yes.

71. Q. Would they not think that you had increased
assessment on the whole holding, if there was any in-
crease?—They know perfectly well that it is only the
new improvements that are exempted.

72. Q. Do they get *sanads* or anything of that sort?
—Yes they do.

73. Q. Are the lands mentioned in the *sanad*?—
Only the area that is benefited by the improvement
is generally stated in the *sanad*.

74. Q. There is a distinct statement in that, that
there will be no enhancement in respect of that parti-
cular land?—Yes. There is some such statement as
that.

75. Q. Is it not the case that during the late
famine, a great many of the wells went dry?—Yes.
I noticed one thing: that the dry year of 1895-96
considerably stimulated well-sinking. More wells
were sunk in that particular year.

76. Q. Do you know what the area irrigated by
wells was in 1899-1900?—I do not recollect that.

77. Q. Have you any idea as to what proportion it
bore to the area ordinary irrigated?—It may be about
 $\frac{1}{4}$ th or so.

78. Q. Then the average area was only $\frac{1}{4}$ th of what
it was in ordinary years?—Yes. The wells in the bed
of streams did not all dry.

79. Q. Suppose we try to treble the number of wells,
would they all fail?—If they are sufficiently deepened,
they will not dry.

80. Q. If the wells are deepened would they hold out
for a lengthened period?—Yes.

81. Q. Were there any wells that were deepened?—A
few wells. They retained water.

82. Q. Did they go down to the rock?—Yes.

83. Q. Then what is the use of deepening them?—In
all places trap rock is not found, but it is found only
here and there. Where there is not much rock, wells
are generally deepened and they retain water for a
much longer period.

84. Q. Have you any idea as to what was done in the
way of deepening wells in the late famine? You say
that only a few were deepened?—I only heard of it
but I have not seen the wells deepened. I was attach-
ed to a jungle part where there were no wells to speak
of. I have heard from intelligent *malguzars* with
whom I have had to deal that they actually deepened
wells.

85. Q. And got plenty of water?—Yes.

86. Q. You think that if wells were deep enough, they
would not fail in a year of drought?—They would not
totally fail but would retain water for a long period.

87. Q. Still it is not a certain means?—Yes.

88. Q. Did they make many *kachcha* wells in the famine?—They had to make *kachcha* wells for temporary emergency.

89. Q. Did they make them during the famine or before?—They also made a few in famine. But they made many wells in 1895-96. They had no means to make them in the famine.

90. Q. Did they make many *pakka* wells?—No.

91. Q. Did they make *kachcha* wells into *pakka*?—Very few.

92. Q. How long do *kachcha* wells last?—Four or 5 years.

93. Q. Most of the wells made in 1895-96 have fallen in?—Most of them are not in order. Gradually they are making them *pakka* as means permit them to do it.

94. Q. Do they require any assistance to do that?—Yes.

95. Q. Are they anxious to make them *pakka*?—Quite anxious.

96. Q. Why don't they take advances?—If advances are easily and promptly distributed, they might take them.

(Mr. Rajaratna Mudaliar.)—You say that the tenants generally know that the land irrigated in consequence of improvement is exempted from enhanced assessment. Do you give annual patta or only once at the settlement?—One for a term of settlement.

97. Q. Do you show all the details in the settlement patta?—No details are shown in it. It does not show what areas are exempted. It simply contains the name, the number of fields, the area, and the amount of assessment.

98. Q. Only those details?—Yes.

99. Q. How then does he know that the improvement is exempted from enhancement?—While announcing the jama, we explain to them that so much has been remitted.

100. Q. That is true. We were told by witnesses that if there is an enhancement on the total holding the tenant does not believe that you have really granted him a substantial exemption?—That is another point. While giving out the jama we assure them that had it not been for the exemption the assessment would have been still higher.

101. Q. Don't you think that it would be better if you should give some details in the patta as to the extent of the irrigated and unirrigated area and the amount of rent upon each and other details?—That would be a capital plan.

102. Q. Would there be any difficulty in showing them?—Not the least difficulty. We have got all the details ready.

103. Q. I find from page 41 of the appendices that the total area has risen from 444,743 acres in 1900-01 to 684,430 acres in the year 1900-01. Can you explain the cause of this large increase notwithstanding the statement in the district note that Nimar gets less rain than any other district in the province.

(Mr. Craddock.)—This is due to the alteration in the district boundary.

(Mr. Rajaratna Mudaliar.)—That is owing to the extension of the boundary of the district?—Yes. And it is also due to new settlers.

(Mr. Craddock.)—A lot of forest tract has been thrown open. Nimar has not suffered at all except in that famine.

(The President.)—It suffered badly in that famine?

(Mr. Craddock.)—Yes.

104. Q. (Mr. Rajaratna Mudaliar.)—To what extent do you think the number of wells could be increased if you had a large sum of money to dispose of and special efforts were made to grant loans without delay?—Do you think that the number could be doubled, trebled or quadrupled?—Trebled. If Government aid could be given to people they might be induced to make wells at their cost. There is a very great desire for constructing wells in the district.

105. Q. (The President.)—It is very different from Bilaspur and Raipur?—Quite different.

106. Q. (Mr. Rajaratna Mudaliar.)—You said that in the last three settlements the water-rate had been lowered. To what extent has it been lowered?—In former years it went up as far as Rs. 12 per acre.

107. Q. For sugarcane?—For all things taken together.

108. Q. That is inclusive of the land assessment?—Yes.

109. Q. What is it now?—The extra assessment is one rupee over the ordinary assessment. One rupee in Khandwa and Rs. 1-12-0 in Burhanpur.

110. Q. Rs. 12 for watering wheat?—Yes. They generally irrigate wheat. Mr. B. Jagannath.

111. Q. For the same crop you have reduced it to one rupee and Rs. 1-13 excluding the land assessment? 19 Mar. 02

112. Q. (Mr. Craddock.)—What crops do they irrigate when they have a well?—They irrigate wheat, masur, chenna, gram, vegetables, and chillies.

113. Q. Do they use wells for garden crops or chiefly for field crops?—Chiefly for garden crops.

114. Q. What class of cultivators generally sink these wells?—Goojahs, Rajputs of Burhanpur, and Kunbis.

115. Q. Not confined to Kachis and Malis?—No.

116. Q. Have you ever seen them irrigate any *juar* or cotton?—I have never seen them do it, but only heard of it.

117. Q. This year, for instance, *juar* and cotton suffered a good deal for want of rain?—Yes.

118. Q. Has any water been given to them?—In very few places.

119. Q. Have you seen any?—I have not.

120. Q. What is the reason?—In the first place wells are very few and wherever there are wells they want to retain the water for irrigating *rabi*.

121. Q. There are very few wells that command *juar* and cotton lands?—Yes.

122. Q. Do you think that with the increase of wells they would alter their cropping at all?—I am not so very sanguine on the point, because cotton growing is a great inducement in Burhanpur and in the most part of the Khandwa tahsil.

123. Q. Do you consider that cotton growing is more profitable than other crops?—Yes, because it involves little trouble, finds a ready market and pays well.

124. Q. I suppose it is only in a very few years it would be necessary to irrigate cotton even if you had the means?—Yes.

125. Q. Supposing you had big tanks or reservoirs, you could irrigate your cotton crops?—It is only in years of scanty rainfall they would make use of these tanks or wells. But if years continue to be good they would not use them.

126. Q. Is rainfall scanty in Nimar?—Yes.

127. Q. Do you count the year 1897-98 as a failure?—Yes.

128. Q. Don't you get very good cotton crop with early cessation of rain?—Yes, if the rains are sufficient enough in the beginning.

129. Q. In what year has the rain in the beginning not been sufficient?—During the last 5 years, except in 1899 when there was good rain which was sufficient, there has been scanty rainfall.

130. Q. Even for cotton?—Yes.

131. Q. Do you mean that the rain in July and August has been sufficient for cotton?—Yes, so far as cotton is concerned.

132. Q. Where are these wells situated? Are they situated in the valleys?—For the most part in the valleys.

133. Q. Have you seen any wells which could irrigate *juar* and cotton?—No.

134. Q. The point that I want to get at is whether the existing system of wells in Nimar could be utilised or was ever intended for cotton and *juar* crop or whether it was not merely intended for the low-lying lands which irrigation could grow *rabi*. What was the object of those who made the wells. It was not the object of protecting cotton and *juar*?—No. It is only with the object of growing *rabi* that they constructed these wells. The only idea was that they might be sometimes of use for *juar* and cotton, only sometimes, but very rarely. But they are mostly for *rabi* crops.

135. Q. The soil which grows wheat with irrigation would it grow it without irrigation? You have got about 8,000 acres of irrigated wheat in Nimar. Would these 8,000 acres or any portion of them grow wheat, if they had no irrigation?—Yes, when rains are sufficient enough for the land to retain moisture.

136. Q. That will apply to any land. I am speaking of Nimar. Would it pay to grow wheat without irrigation?—It would fail.

137. Q. The reason why they irrigate wheat in Nimar is that it would not grow without it?—Yes.

138. Q. Kanapur-Beria is different from Nimar?—Yes.

139. Q. It is more like Hoshangabad?—Yes.

140. Q. Have they got quite the same number of wells in Kanapur-Beria?—They have not.

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Jagannath.
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141. Q. They grow more wheat than any other part of the district?—Yes.
142. Q. But they have fewer wells?—Yes.
143. Q. When you said that there was very little black cotton soil in Nimar, I suppose you were alluding to very deep black cotton soil?—Yes.
144. Q. Very little of that?—Yes.

145. Q. The district is very much like Khandesh?—Yes.

146. Q. It is much more like Berar than Hoshangabad?—Yes. It is not like Hoshangabad; it is very much like the Berar.

(The President.)—Have you got any embanked fields in Nimar?—Very few.

WITNESS No. 35.—PANDIT ANIYAJI KRISHNA, Malguzar of Nimar.

Pandit
Aniyaji
Krishna.

In reply to question.—I am malguzar of three villages in Burhanpur and grow wheat, gram, linseed, etc. There are no means of irrigation in my villages. Kharif crops, jua and cotton pay better. I grow rabi without irrigation. In Lalbagh where I have a few wells I used to grow *pan*. Now I grow garden crops only.

There is some irrigated wheat in Khandwa. There used to be opium also, but now it has been stopped, therefore, I irrigate wheat. In Burhanpur wells were made in the famine—perhaps 50 in the whole tahsil. I used them to grow jua fodder, and for rabi. This is an old practice, I find water at 45 to 60 feet. To increase the number of wells would be a good protective measure. We wanted advances in the famine, but could not get any. People would now willingly take *takavi*. *Takavi* should be given to poor people without interest and half the principal would be re-

mitted. Those better off would repay in long instalments and with low interest, say three per cent. We have to pay 12 per cent. to the *bania*. If instalments were increased, there would be no need to reduce interest. I would allow ten years for recovery and take first instalment after 12 months. Now it is taken in six months.

If recovery were begun in two or three years and were lenient, there would be no need to reduce interest or remit any part of the principal.

If *takavi* were made repayable in 30 years and were exempted from enhancement I would give out Rs. 30,000 or Rs. 40,000 and be responsible for it.

Tanks cost more than wells to build. We could have 10 or 12 times the present number of wells.

I have 50 acres *sir* land, and one well which I used to raise fodder in 1899.

WITNESS No. 36.—RAO RAM SINGH, Malguzar of Nimar.

Rao
Ram
Singh.

I own seven villages, three of which are revenue-free. I grow jua and cotton and very little wheat or gram. Now wheat can be grow without irrigation. There are 15 wells in the seven villages; only two or three of them are used for irrigation. All the wells except two or three dried up this year and all kharif crops died.

People did not know about *takavi* before; they are

now applying for it. I have given *takavi* to about six during the last two years. There is no great demand. The conditions on which *takavi* is granted are hard on the poor. In my opinion five or six years are enough for repayment; but the means of the persons receiving *takavi* and the amount given must be considered in fixing the period for recovery. If conditions were made more lenient, many would take *takavi*. No interest should be charged from the poor people.

WITNESS No. 37.—PANDIT DIN DYAL, Malguzar of Betul.

Pandit
Din
Dyal.

I own nine villages. I grow kharif and rabi and irrigate sugarcane from well. In the nine villages there are about 50 wells for irrigation. I irrigate sugarcane and wheat in dry years. In irrigating wheat in ordinary years there is fear of rust. Sugarcane cultivation decreases in dry years. Sugarcane mills are used in my villages. Cane cultivation will increase again in good years.

People will make wells if they are given *takavi* advances. About 20 wells have been made from money borrowed from the soucar who takes 12 to 18 per cent. interest. Last year some applied for and got *takavi*. Nine or ten men made wells from *takavi*. They knew the assessment will not be increased for two settlements.

In famine time, out of every Rs. 100 advanced, Rs. 20 only were recovered. The borrower was allowed no fix time for recovery which was generally three to five years. Time should ordinarily be ten years. It

is advisable to fix a short time like this, otherwise there may be difficulty in recovery. Recovery should be begun in four or five years, so as to allow the cultivator time to make his well and clear off his debt. Many would take *takavi* if interest were begun in fourth year, none being charged for the first three years, and 15 years allowed for recovery. I would prefer 15 to 30 years if interest were charged in this manner.

There is scope for tanks in the Betul district; I have noted 11 sites, none of them are however in my villages. Tanks would be made for irrigation of wheat and I would make them in my villages if I had funds, and would irrigate from them in dry years only.

I would repay *takavi* loans every year if I could get them at reduced rate, say about Rs. 4 per annum.

There is much scope for bunds in Betul owing to the country being full of undulations.

WITNESS No. 38.—CHOUDHARI PALANDAR SINGH, Malguzar of Hoshangabad.

Choudhari
Palandar
Singh.

I own villages in Seoni, but not in rice parts, also four villages in Narsinghpur where I grow chiefly rabi crops. Embankments may be made in Narsinghpur, but not in Gadannara, some have been made in the latter as famine relief works. No banks necessary in Gadannara as chiefly kharif crops are grown there.

Takavi is not given to ordinary cultivators. People would take *takavi* if instalments were remitted in bad years. Three years are now allowed for recovery. I took Rs. 1,000 in famine, of which Rs. 200 have been remitted. I am paying back the balance in three years.

WITNESS No. 39.—PANDIT KASHIRAM TEWARI, Malguzar of Hoshangabad.

Pandit
Kashiram
Tewari.

I am malguzar of one village in Hoshangabad and grow wheat. There is no irrigation in my village, and there is one well 75 feet deep from which I irrigated my garden in the famine. There are no wells even where water is at 15 or 22 feet depth; the people are not accustomed to have wells. There is no bund in my village. The soil is black and the ground rough. Wheat is never irrigated. Jai Singh Thakur irrigated wheat in famine.

5. Q. Wheat?—Wheat, gram, and *terai*.

6. Q. Do you irrigate it at all?—I did irrigate a little piece of land.

7. Q. Does it do good to irrigate black soil?—It does do good.

8. Q. What is the prejudice against irrigating it? Why do they not irrigate it more? One always hears that the black cotton soil should not be irrigated?—Cotton soil is very different from wheat soil.

9. Q. I understand that, but it is black soil?—This black soil which produces wheat is of a superior quality. It is inferior black soil that produces cotton. It is the superior one that is in our tract.

10. Q. That is the wheat soil?—Yes.

11. Q. That is in the valley of the Nerhudda?—Yes.

12. Q. Does irrigation do equal good?—Yes.

13. Q. Every year?—Yes.

(The President.)—You are a malguzar in the Hoshangabad district?—Yes.

1. Q. How many villages have you got?—I have got 3 villages.

2. Q. Have you got irrigation in your district?—Very few acres under irrigation.

3. Q. What is the soil?—Black soil.

4. Q. What do you grow—kharif or rabi?—Mostly rabi.

Pandit
Kashiram
Tewari.

14. Q. How do you irrigate it?—By a well.
15. Q. Have you got a large number of wells?—No.
16. Q. If there was a canal would you take water from it to irrigate this black soil?—There cannot be a canal.
17. Q. Why not?—The Nerbudda is too deep and there is no level enough land.
18. Q. The only way to irrigate it is by means of wells?—Yes.
19. Q. Can you irrigate it by tanks?—Yes, it can be irrigated.
20. Q. Tanks will be good enough?—Tanks and *bhandwas*.
21. Q. You do a great deal of *bhandwas*?—Yes.
22. Q. Supposing there were tanks made, would people keep water for wheat or would they use it for rice?—For wheat, not for rice. The land being irrigated, two crops of rice and wheat could be grown.
23. Q. Is there any rice at all in your district?—None at all.
24. Q. Did your district suffer very much in the last famine?—Yes.
25. Q. Great loss?—Great loss for 6 or 7 years.
26. Q. Great loss of cattle?—Cattle and every sort of agricultural thing.
27. Q. What do you think that the Government should do to prevent that loss?—I think the Bandia system should be extended in Hoshangabad.
28. Q. Did the embanked fields give a good crop?—They gave some crop.
29. Q. There are not many of them?—No; very few.
30. Q. Would people be willing to take *takavi* advances in order to make these bunds?—Yes, if the Government pleases.
31. Q. Would it not be an advantage to the people?—Yes.
32. Q. Then what prevents them from doing it? Why do they not ask Government to advance the money?—The thing is that there was plenty of rain before and therefore there was no necessity for any irrigation and for taking loans. But by famines attacking the village every now and then, they are already ruined. They are now going to ask the Tahsildar for *takavi*; but this is only for seeds and cattle and not for Bandias. But our popular Deputy Commissioner has introduced the system this year and has given us some money for Bandias.
33. Q. You say that they are not asking for money for that?—Yes.
34. Q. Why don't they ask for money for Bandias?—It is only now they came to know that they could not get any produce without Bandias.
35. Q. Do you know how many of the tenants and *malguzars* would come forward for loans?—I do not know exactly. Nearly half of them are coming forward.
36. Q. So that in a year or two there would be far more Bandias than there are just now?—Yes.
37. Q. And you think that the Bandia system is better than tanks?—Yes.
38. Q. Do any *malguzars* make tanks?—They do. But they are not as profitable as Bandias. Inferior soil can be irrigated by tanks or wells, but not superior soil.
39. Q. Do they make any little channels from the Nerbudda itself, such as *tars*?—No; cannot.
40. Q. It is too deep for them?—Yes.
41. Q. There is not very much water in the Nerbudda at this time?—Not so much, but is too deep.
42. Q. (Mr. Rajaratna Mudaliar.)—When a large number of these Bandias are made and there is normal rainfall, would not wheat be attacked with rust. Is there no fear of that?—No. We could have it watered from the Bandias.
43. Q. Do you provide any sluices for these Bandias for the water to escape or do you cut them?—We adopt the system of having sluices.
44. Q. Masonry sluices?—Yes.
- (The President.)—How high do you make the Bandias?—Five or 6 feet.
45. Q. Do you know how much it costs per acre?—Rs. 10.
46. Q. (Mr. Rajaratna Mudaliar.)—In the case of these bunded fields by how much is the outturn of the produce increased?—The outturn is doubled.
47. Q. Why don't the people do it to a much larger extent?—Because the people are too poor.
48. Q. To induce them to take *takavi* loans from Government what would you recommend, any reduction of interest?—When we are going to improve our cultivation, we should have some *takavi* without interest and we must be allowed to repay the loans in instalments.
49. Q. What period would you recommend for repaying the loans?—I think not less than 10 years.
50. Q. The rule allows 35 years. Do you think that such a long period is desirable?—When large capital is advanced, that period may be allowed, but when one borrows Rs. 200 or Rs. 300 the period of 35 years is too long.
51. Q. But when a tenant wishes it, a longer period may be given?—Yes.
52. Q. That would be an inducement. Would it not be?—May be, but not for small sums.
53. Q. Do you think it a good plan to give loans to *malguzars* and ask them to distribute them to tenants?—That will be a better plan.
54. Q. That would avoid delay?—Yes. When people apply to the Revenue Inspector for loans, their applications are forwarded to the Tahsildar and then some enquiries are made and it is not until after the expiry of 2 or 3 months that the loan is obtained. By that time they suffer.
55. Q. Do you think *malguzars* would be willing to be responsible for the recovery of the loan?—Not when they are not repaid.
56. Q. Unless they take the responsibility, how can you expect the Government to give the loan?—The *malguzar* can recommend loans to tenants and try his best to have them realised from them. He cannot be responsible for the recovery of the loans nor could he recover the loans from the tenants without the aid of legislation. He cannot realise his own rents from the tenants without suing them.
57. Q. Supposing the power is given to them to sell the land for the recovery of loans, will they then be responsible?—Yes. But between the *malguzar* and his tenants there may be some enmity and it is possible that the former might ruin the latter by abusing the power.
58. Q. Then you simply say that they should recommend as to who could be given loans?—Yes. He may say whether one is entitled to get a loan or not. A man does not now get a loan if he is not recommended by the Putwari or the Revenue Inspector.
59. Q. Does not the Revenue Inspector now enquire of *malguzars* as to the person to whom a loan should be granted?—No. They do what they like. They have nothing to do with *malguzars*.
60. Q. Have you any idea how much area is protected by embankments, $\frac{1}{4}$ th or $1\frac{1}{2}$ th?—I cannot say.
61. Q. Can you say to what extent it has increased within the last 6 or 7 years?—No, I cannot say.

SIXTY-FIRST DAY.

Pachmarhi, 20th March 1902.

Witness No. 40.—Mr. MAYES, Deputy Commissioner of Nimar.

1. Q. (The President.)—You are the Deputy Commissioner of Nimar, I understand?—Yes.
2. Q. How long have you been there?—Only since December last.

3. Q. Before that were you in Bilaspur?—Yes.
4. Q. How long?—16 months.
5. Q. Were you there through the famines?—Yes.
6. Q. Where were you in the 1896-97 famine?—I was in Balaghat.

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Mayes.
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Mr.
Mayer.
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7. Q. In Nimar you don't have much black cotton soil?—It is found mostly in small pockets.

8. Q. Is it merely cultivated in the same way as other soils are or is there any special means of cultivating it?—It is cultivated in the ordinary way except where it is irrigated from wells.

9. Q. It is not irrigated black cotton soil?—It is irrigated only from wells.

10. Q. Have you got any other means of irrigation in Nimar except wells?—One tank.

11. Q. A celebrated sort of tank?—Yes.

12. Q. Is black cotton soil steadily irrigated from wells?—Yes.

13. Q. Well irrigation is practically the only irrigation that you have got?—Yes, practically.

14. Q. Have the events of the last few years brought about any great increase in the number of wells?—Yes, Mr. Sly's note gives the exact numbers.

15. Q. (Mr. Muir-Mackenzie.)—Are the numbers exact?—I do not know. I saw Mr. Sly's note only yesterday. That shows a considerable increase in the number of wells.

16. Q. (The President.)—I understand that the number of wells given in this table means the number actually in use. If the well does not irrigate, it is left out, I understand?—I am not sure. I see Mr. Harriott gives the number as 3,332 wells used for irrigation in 1899-1900. I think that number includes all the wells in the district.

17. Q. The number of temporary wells in 1898-99 was 2,124, whereas in 1899-1900 the number was reduced by 200. It was explained to us that if a well was not being used, it was not counted?—Yes.

18. Q. The area under wells increased from 10,534 acres in 1890-91 to 14,369 acres in 1900-01?—Yes.

19. Q. Are you giving much *takavi* for wells?—I am giving it out slowly. I have just come to this district and discovered this well irrigation. I am now trying to give out *takavi*.

20. Q. Do you find that men take it freely?—They say they will take it. That is what they say in every district. But then they don't turn up.

21. Q. We have found that in the Central Provinces generally very much less *takavi* is given than in other parts of India. They are very much slower in taking it up here, whereas very large amounts are taken in other parts. Have you got as much money as you could give them for *takavi* purposes?—Yes.

22. Q. Can they use it to the full?—Yes. In fact I have more. I gave it to another district that wanted it.

23. Q. (Mr. Muir-Mackenzie.)—What was your allotment this year?—That I could not tell you.

24. Q. Was it as much as Rs. 25,000?—Less than Rs. 25,000. It was about Rs. 10,000 I think.

25. Q. You could not get rid of even that?—No. At least my predecessor did not do that.

26. Q. (The President.)—You have not got time to devote very much attention to that subject?—I have not yet had time.

27. Q. Did you give out any *takavi* for tanks in Bilaspur, anything to speak of?—Very little indeed. You will find the figures in Mr. Sly's statement. It was not much. All the tanks were done with Government money in Bilaspur.

28. Q. That was during the famine?—Yes. Where we did give out large sums was in Balaghat in 1896-97.

29. Q. For tanks?—Yes. Mostly famine loans. I do not think they are shown in these figures.

30. Q. We need not ask you about measures that should be taken to make people take loans more freely as you have had hardly time to study the thing?—The best measure to stimulate loans is for the Deputy Commissioner and his Assistant to go round and give money on the spot and thus save people all trouble of getting it.

31. Q. Will they have time?—They should do it in their cold weather tours.

32. Q. We have heard serious complaints in some places of the long time that is taken before a man is given an advance—sometimes 6 months or a year. I think it is generally brought home to the fact that subordinates are perhaps over-careful in making sure that the applicant is a genuine cultivator and has got good security, and they have so much to do that they cannot devote very much time to this matter?—That is very frequently the case.

33. Q. Is there any irrigation done from the Nerbudda in your district?—I think there is one water lift.

34. Q. Only one?—That is all I have seen.

35. Q. Is the river very low, below the surface of the country?—Yes.

36. Q. (Mr. Muir-Mackenzie.)—How high was that lift?—It was a double lift raising about 15 feet.

37. Q. (The President.)—There is no river margin which is cultivable?—No. All along the Nerbudda, it is mostly jungle, except just one part where I have not been yet. It is just along the Kanabu valley which is a rich country. There the bed of the river is very low. I think it is about 60 feet.

38. Q. In some places a very large area is irrigated by the river water in a narrow zone on each side of the river. In Madras we have some magnificent spreads of irrigation for just a mile or two?—I have seen one or two of these very small nallas with bunds placed across them. They take the water from the nalla down the channel just to irrigate the fields along the banks.

39. Q. I suppose you would say that to protect your district from famine, as far as irrigation is concerned, wells and wells only are the means of doing it?—Yes. My predecessor who has been in the district for some time has a note on it.

40. Q. Who is he?—Mr. Walker. "On the whole" he said, "I think it may be said of Nimar that if the rain is sufficient to fill irrigation tanks, it will probably suffice to prevent such a complete failure of crops as to induce an actual famine."

41. Q. He does contemplate irrigation tanks?—Yes. In the same way as regards wells, the area that you can irrigate from wells is limited.

42. Q. And yet the number of wells is perfectly unlimited?—I do not think you can find water everywhere. That is the difficulty that Nimar suffers from. Very often people would not take *takavi*, because they are not certain of finding water as they get down to the hard rock.

43. Q. Do you think it would be an advisable thing to attach to your district an expert in boring to probe for wells?—I do. Very often I ask people "why will you not take *takavi*?" They say "we are not certain of getting water."

44. Q. Do you know how wells behave, as a rule, in the famine. Many of them run dry?—Well, so far they were fairly successful until this year. They never had such a drought as they have now.

45. Q. (Mr. Higham.)—That is the year following drought?—We only had 15 inches of rain, the last rains against an average of 28 or 30 inches.

46. Q. (The President.)—That is the rain for 1901?—Yes.

47. Q. (Mr. Muir-Mackenzie.)—What was the rainfall in 1899-1900?—Seven inches.

48. Q. That was not quite so bad as this?—Yes.

49. Q. (The President.)—What is there besides wells which one could do to help the district. Would they take to tanks, if tanks were there?—I do not know. The cultivators of Nimar have had no experience of tanks. The native of India does not like anything of which he has not had experience?—He has not got very far to go to see tanks. If he went to Balaghat or anywhere in Chhindwara he would see tanks there. I do not know Chhindwara. I don't think he would wander. He does not wander. Our one tank shows that they will take to them.

50. Q. Although it is allowed to go to the bad?—Yes.

51. Q. Is there any demand made for its restoration. Have you any intention of restoring it?—Yes. It is a part of the scheme laid down.

52. Q. (Mr. Higham.)—I do not quite understand about these areas irrigated by wells. The area irrigated in 1894-95 is said to be 11,000 acres. That may be regarded as a normal area?—Yes.

53. Q. That fell to 5,000 in 1899-1900?—Yes.

54. Q. Is that due to wells going dry by degrees?—I should presume it is due to wells going dry.

55. Q. That is in 1899-1900. I do not know how these years are counted. Is it a revenue year?—That would be from the 1st of October, I think.

56. Q. You say that they have never been so low as this year. What year is that?—1901-02.

57. Q. (Mr. Craddock.)—You have not got any returns?—No.

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58. Q. (Mr. Higham.)—That is the year following drought?—It is a year following low rainfall. The fall in the area irrigated in 1899-1900 was due to small rainfall in the monsoon of 1899.

59. Q. You may probably expect a still smaller area in 1901-02?—I do.

60. Q. (Mr. Muir-Mackenzie.)—You had one year between them?—Yes. We went up very low then, in 1900-01. There were 10,000 acres of wheat under irrigation. There was good rainfall in July 1900.

61. Q. (Mr. Higham.)—Last year you were dry again?—Yes. Last year we were very dry.

62. Q. (The President.)—That is in 1901?—Yes.

63. Q. This well irrigation is chiefly for wheat?—Yes, almost entirely wheat.

64. Q. The irrigation of 1900-01 ought to have been pretty good?—It was.

65. Q. (Mr. Higham.)—I see in 1900-01 you went up again?—Yes.

66. Q. 10,000 acres for wheat only?—10,500 acres.

67. Q. That is more than the normal?—That is the biggest wheat area we have had.

68. Q. On page 22 of the District Note Mr. Crawford says that there are 4 old tanks of small size which have fallen into disuse and that the cause of this was that their embankments gave way and the tenants preferred digging wells in their own fields as they thought that the well system was easier and cheaper. Do you think that is an argument against making tanks in Nimar district?—The argument is one that appeals to them, as to the well system being easier and cheaper.

69. Q. Is it because it is easier and cheaper to make wells than to repair tanks or is it because they are not at all sure of the supply even when they repair the tanks?—That I am not sure about. There are very small tanks and they were built more for drinking purposes than for irrigation.

70. Q. Do you know anything about Lachora tank? I have not seen it yet.

71. Q. The irrigation under that tank appears to have fallen from 300 to 100 acres?—Yes.

72. Q. It is under the management of the District Council?—Yes, at the present moment, I believe.

Have you any idea as to why irrigation has fallen off to that extent?

(Mr. Craddock.)—The rates were raised.

(Mr. Higham.)—The rates were raised many years ago.

(Mr. Craddock.)—You will find it on page 10 of the District Note.

(Mr. Higham.)—The rate was raised to Rs. 10 per acre for sugarcane and Rs. 4 per acre for other crops and the latter rate is still charged for water for irrigating wheat and rice. This is what the note says. During the famine the rate is said to have been reduced by one-half?—Yes.

73. Q. Even then they did not get much area under irrigation?—Very likely, because the water was low.

74. Q. I do not see why they should have lowered rate in the famine year. I should have thought that was the time for raising it?—They thought of giving the people a chance.

75. Q. Suppose you improve and enlarge the tank how much would it irrigate?—It could irrigate only 500 acres.

76. Q. (Mr. Muir-Mackenzie.)—Even if enlarged?—So I believe.

(The President.)—I can hardly look upon it as a typical case. If tanks were really of great value, they would have multiplied by this time.

77. Q. (Mr. Higham.)—My point is that the value of the tank has not been fairly tested. It has been placed in the hands of the District Board and they put on a prohibitive rate. They have not nursed the irrigation. The first thing I should do is to take it out of the hands of the District Board. Do you know whether it is still in the hands of the District Board?—I do not know. I am anxious to take it out of the hands of the District Board if it is still under them.

78. Q. Don't you think it could be taken out of the hands of the District Board to see what can be done with it as an experiment?—I think that would be a very excellent idea.

79. Q. The general tendency in Nimar shows that tanks are no good and nothing but wells would be taken. But tank irrigation has not been tried there?—Yes. It has not had a fair chance.

(The President.)—It will rather come under the case to which Mr. Sly's maxim is applicable. He says in paragraph 8 "No irrigation scheme should be taken up in a tract where its utility cannot be justified by existing agricultural practice in that tract or in a tract with similar conditions."

(Mr. Muir-Mackenzie.)—Can you tell me whether the soil in Nimar has any similarity to the soil of the adjoining district of Hoshangabad?—It is all cut up. It is very much more cut up than the soil of Hoshangabad. It is more a rolling country, the top of which is either rock or very poor soil. Then there are little pockets of black cotton soil where the trap is disintegrated, just at the bottom.

80. Q. Nothing done in Nimar would be typical of what is done in Nerbudda higher up?—I know very little of Nerbudda district.

81. Q. (Mr. Craddock.)—Kanpur-Beria where Lachora tank is much more similar to Hoshangabad?—Yes.

82. Q. (Mr. Muir-Mackenzie.)—Are Nimar cultivators an energetic set of people?—They are good cultivators.

83. Q. You think that if you had your staff increased you would be able to get rid of more *takavi*?—The difficulty I see in getting people to take *takavi* is the uncertainty of striking water.

84. Q. Suppose you overcame that difficulty, do you think you would be able to get them to take *takavi*?—Yes. I could get rid of much more.

85. Q. Are you afraid of their taking *takavi* because there are people who cannot offer good security?—No.

86. Q. You can get security?—Nimar has not been very bad. In the first famine it was not hit hard at all.

87. Q. What about the other districts you know. In Balaghat, do you think there would be any difficulty in getting people to take *takavi*?—They have got as much as they can take. We have filled them up in 1896-97. They cannot take more as they are too poor.

88. Q. There is a great drop in the number of wells in 1899-1900. That, I understand, is due to the fact that the figure mentioned in the statistics represents number of wells used?—Yes.

89. Q. That is a complete contrast to what happened in my part of the country, the Bombay Presidency. So far from the number of wells being decreased, they have almost doubled or trebled it, because the people, in order to save themselves, immediately set to digging wells wherever they could possibly do it?—In Nimar the cause of the drop in the number is that there was no water in the wells and they dried up. When a man sees a well drying up, it is no incentive to him to build another well.

90. Q. There too wells dried up and the area irrigated by wells also dropped enormously. They had to deepen their wells, took a great deal of trouble and they struggled on. Do you think there is no hope of getting the people to do a similar thing here and to see what can be done with wells?—In the time of famine?

91. Q. Yes. You had wells for famine relief works, and people had to deepen their wells for their water-supply?—I cannot say whether they did it or not.

92. Q. Amongst other things you said that they were not hard hit?—Not very hard hit, not so bad as other parts of the Presidency.

93. Q. Reverting to the question of *takavi* in Balaghat, you think that the people are so poor that it is difficult to give them any more *takavi*?—Yes.

94. Q. Is it the same in Bilaspur?—Yes.

95. Q. Do you think it is safe to give them *takavi* for long periods, say 30 or 40 or 50 years or give it to them on the condition that they should merely pay the interest until they get better settled?—I do not think you would get many of them to take it.

96. Q. You think not?—Yes.

97. Q. Why not? If a man has very little to pay back every year would it not tempt him to take loans?—I doubt if he would take them.

98. Q. Can you give me any reason for doubting it? It is rather a serious thing to think that we cannot give him any more money with the hope of getting it back?—He might perhaps take it if you give him a long period for repayment.

99. Q. You say that very careful enquiries are made about securities. Do you accept as security a land which has been previously mortgaged?—That is usually an obstacle.

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100. Q. Why should it be an obstacle?—Because the mortgagee has to be first paid off.
101. Q. Has not the Government got a prior claim in the matter of Land Improvement loans?—I don't think so.
102. Q. Are the Nerbudda and the Tapti both very deep?—Yes.
103. Q. Are there not many other places where you could lift water except the place where they had a double lift?—I have not seen any other.
104. Q. (*The President.*)—Double lift is not a great thing after all?—Yes.
105. Q. (*Mr. Muir-Mackenzie.*)—Do you think that the sub-soil water level could be ascertained accurately by a survey of the levels of the existing wells?—All the wells are practically in rock. You have to go down into the rock before you can find water.
106. Q. What we want to know is how deep below the surface that you could get water?—The average depth of wells is 30 feet.
107. Q. Could that be ascertained all over the district?—Yes, you could ascertain it.
108. Q. You have not got any data?—I have got no data for it.
109. Q. You did not put it down in your records?—No.
110. Q. Is there any question of *kans* grown in any part of your district?—We have not got it yet.
111. Q. (*Mr. Rajaratna Mudaliar.*)—Supposing the Government undertook to construct wells for the tenants do you think they would use the water?—Certainly they would.
112. Q. Would you advise such a step being taken?—No, because they can always pay off the money for wells. A well does not cost much and they can get enough profit to pay it off.
113. Q. You said that the difficulty was to induce them to take loans for wells because of their doubtful success?—Yes.
114. Q. Suppose the Government sank a well and it proved a success, would they take it?—You can dig the well on condition that if the water was struck they should pay for it. Then you would get them to take it.
115. Q. Or would they like to leave the well as a Government work and pay an enhanced rent?—I have never asked them about it. But I think they would rather own the well themselves.
116. Q. Would not they think that the cost of a well constructed by Government would be much greater than if it were constructed by themselves?—The Government would probably get them to dig it. That is how I should do it.
117. Q. To get over the difficulty, might we not remit the loans in the case of a well, if it does not prove successful?—I would not go quite so far as that. I think they would pay a certain share of it.
118. Q. That is even if it is unsuccessful?—Yes.
119. Q. It would be well of course if they do pay?—Has the matter been explained to them in that light?—I have not done so.
120. Q. You think that if they were sure that a certain share would be remitted by Government, they would take loans?—I think they would then take them more freely.
121. Q. (*Mr. Craddock.*)—Do you say that no well irrigates either *juar* or cotton?—It was all cut before I came. I do not remember having seen anything of it.

122. Q. You have never seen any *juar* or cotton being saved?—No.

123. Q. What is your crop this year, *juar* and cotton?—Cotton crop about 8 annas and *juar* 6 annas.

124. Q. That was on 15 inches rain?—Yes, in spite of grasshoppers and rats. Rats are affecting the *rabi* and grasshoppers have done an awful lot of damage to *kharif*.

125. Q. In 1896-97 there was no September rain in the district and the rainfall up to the end of August was 33 inches as compared with the normal of 24 inches. The rainfall has been heavy up to the end of August and they pulled through in 1897-98?—Yes, so they did in the Nagpur country.

126. Q. You don't think that there is much prospect of making irrigation general for cotton and *juar*?—Oh no.

127. Q. Do you think that if large tanks were constructed people would give up *juar* and cotton and grow wheat instead?—I do not know.

128. Q. (*Mr. Muir-Mackenzie.*)—Can you grow *juar* under wells?—No.

129. Q. I mean *rabi juar*?—I have not seen any *rabi juar*. It is a secondary crop.

130. Q. (*The President.*)—It is only a *kharif* crop?—Yes, *juar*.

131. Q. (*Mr. Craddock.*)—You don't think they would substitute other crops if they get tank irrigation?—I could not say. It is problematical.

132. Q. I suppose they get very good profit out of their cotton?—It is a very paying crop.

133. Q. You have some experience of cotton tracts in Nagpur and Wardha as compared with the ordinary wheat or rice tract. Do you consider that people in the cotton tracts are more prosperous, as a rule, than the people of wheat tracts, taking wheat and the rice on the one side and cotton and *juar* on the other?—Very much more prosperous.

134. Q. And there has been no irrigation of *juar* and cotton, that you have seen?—No.

135. Q. In spite of the bad years of 1899-1900 and 1896-97, you find that cotton and *juar* people are better off than others?—Excellent. I went round their villages and I found that they paid both *kists*.

136. Q. In spite of 8 annas and 6 annas crops?—Yes.

137. Q. You collected some suspended revenue in Nimar?—Only in the *ryotwari* tract it was suspended and that tract has gone to the smash again.

138. Q. (*Mr. Rajaratna Mudaliar.*)—Would you argue from that that if people took to cotton and *juar* in wheat tracts, the same results could be obtained?—No.

139. Q. (*Mr. Craddock.*)—If you put Hoshangabad and Nerbudda under *juar* and cotton they would be more prosperous?—If they are able to put all rice country under *juar* and cotton, they will be more prosperous, but they have not got the soil to do that.

140. Q. Another question I wish to ask you is whether it is a fact that the average rainfall in *juar* and cotton tracts is a good deal less than the average rainfall in other parts?—Very much lower.

141. Q. I suppose you have noticed possibly in the Nagpur country and elsewhere that in the wheat soil cotton and *juar* is not much of a success?—It is not grown in the Nagpur country. You can come across wheat area towards the south and cotton and *juar* towards the north.

142. Q. There is a certain amount grown in the Umrer tahsil where you may recollect the crop is not so fine as elsewhere?—Yes, certainly it is not.

WITNESS No. 41.—Mr. C. E. Low, I.C.S., Officiating Deputy Commissioner, Hoshangabad.

Replies to printed questions.

A.—GENERAL.

Mr. C. E. Low.
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1. Q. Hoshangabad or Bilaspur as stated against each question.

Hoshangabad.—Settlement Officer from December 1900 to August 1901. Officiating Deputy Commissioner since then. Assistant Commissioner from October 1894 to April 1895.

Bilaspur.—Assistant Commissioner through the first famine, December 1896 to July 1897. Settlement Officer from November 1898 to December 1900, including the second famine, when I was in famine charge of half the district. In 1896-97 I had practically all the Land Improvement Famine Loan work of the dis-

trict to do; and in both famines I had a good deal of experience of laying-out sites of village irrigation work and of observing the after-effect of the work laid out by me in the famine of 1896-97.

2. Q. See answers of Commissioner of Settlements and Agriculture.

3. Q. (1) Agricultural population in Bilaspur is quite sufficient to deal with a fully irrigated tract. In many parts it runs to nearly 800 to the square mile. Most holdings are less than 10 acres in extent.

In Hoshangabad holdings are much larger. The bulk of the land is held by big tenants paying Rs. 20 to Rs. 100, who do not keep enough labour to cultivate in good style even existing crops.

The size of holdings in Bilaspur has decreased about 10 per cent. in 12 years, and should be small enough to admit of very close cultivation in 30 years' time.

(2) There are plenty of cattle in Bilaspur, but they are very poor and small.

In Hoshangabad there are far fewer cattle relatively, but they are of much better quality. Greater prosperity induced by irrigation would gradually bring more cattle. At present they are no doubt insufficient in both cases.

(3) Manure is even at present not nearly enough used in Bilaspur. There is no wood for burning in the plain villages and cow-dung nearly all goes as fuel. Only the best fields get any other manure than village sweepings and ashes. Pitting and a more scientific disposal of the village drainage are quite feasible.

The site of a village is often changed so as to utilize the drainage water. I do not think, however, any practicable improvement would result in a saving of enough manure to do more than manure about one-third of the fields well enough for irrigation, unless an abundant supply of other fuel were possible, or the number of cattle greatly increased.

Hoshangabad.—More fuel is available, but the facts are not so well known to me as in Bilaspur. Manuring is hardly ever practised save for garden crops.

(4) This is the most important question in connection with irrigation in the Central Provinces. In Bilaspur my experience went to show that irrigation of rice in black cotton soil was only practised by the people in about one year in four, and then only when the September rainfall was short. Wheat irrigation in Bilaspur is practically unknown.

I have only seen it practised in three villages; but, singularly enough, in one of those villages it is practised in most years. The irrigation in all cases is of a very poor character; and it does not relatively benefit crops in black soil much save in dry years. Still *bahra* fields in rice cultivation and embanked wheat fields have the effect of holding up large quantities of water received from other fields; and even black cotton soil fields in either of these positions are much more valuable than when they receive only the direct rainfall.

The point is so important and so doubtful that I think it ought not to be decided without specially conducted experiments.

(5) I am unable to give any opinion.

(6) In the Bilaspur district, where holdings are small and the villagers are accustomed to turn out and work for a common object, I think the plentiful labour supply would take the place of capital. In Hoshangabad there would be difficulties, as capital has disappeared to a great extent and the village community is not so united.

(7) No. The people in Bilaspur thoroughly understand the way in which exemptions for improvements are given.

(8) No.

(9) In Chhattisgarh it is unlikely that the people will ever help themselves much in starting irrigation by making tanks, owing to the fact that holdings are so scattered. Nearly all tenants have their fields scattered over the whole village. The providing of water by Government whether from tanks or canals would obviate this difficulty.

Legislation to permit of compulsory exchanges of fields between different holders under the orders of a revenue officer, with proper safeguards, would result in a great extension of tank building; but would be liable to many abuses no doubt.

(The Commissioner of Settlements and Agriculture will no doubt answer the first part of this.)

4. Q. I consider that, *quâ exemptions* from enhancement, the present regulations are ample; but I feel sure that the release of a small area from assessment altogether for a term of years would be a great inducement to make improvements. I have been often asked by *malguzars* in Bilaspur to do this for them. Thus, if a *malguzar* built a tank to irrigate say 80 acres, which is a good deal for the average village tank, and say 50 acres were his own and 20 acres of the ryots, then I would give him a *sanad* allowing him to hold 10 acres as a *muafi* grant for the term of settlement. He would prize this out of all proportion to its real pecuniary benefit.

5. Q. No. Partly because men do not understand the conditions; partly because these applications, coming as they often do from men who intend to misapply the money, are scrutinized pretty carefully, thereby causing delay and disappointment.

Again, the cost of an improvement in most cases is greater by far than the capitalized value of the annual increase of outturn. This is due partly to the rough way in which improvements are made; but more still to the absence of joint action of a large body of cultivators at one time. One embanked field costs twice as much per acre as a number all together.

Again, the security of the crop due to irrigation can hardly be expressed in terms of cash: Rs. 1,000 one year and *nil* next year is not nearly so good an income for a farmer as Rs. 500 a year certain.

What is needed then is (i) encouragement to take loans, (ii) to induce united action, (iii) to allow a deduction from the amount to be repaid in order to lessen the apparently unprofitable nature of the transaction to some extent. I would recommend a grant-in-aid proportionate to the amount taken; this could be done till the practice had caught on. I would recommend no such concession in a tract where the practice has well established.

Next as to the extension of the period of repayment.

The period allowed by the Act is ample, but the policy of higher local authorities has often been to restrict this.

In 1896-97 I gave out loans fixing certain periods of repayment in almost all cases less than 10 years. The period was subsequent to the taking of the loan shortened by the orders of the higher authority for reasons unknown to me, while I was absent from India. This caused much discontent and many recipients of *takavi* stated that they would not take any more. I think this should not be allowed to happen, and executive instructions issued encouraging local officers to allow longer periods. At the same time more care should be taken to see that the money is properly spent.

6. Q. I know nothing of part I of the question. As to part II, both in Hoshangabad and Bilaspur people are exceedingly keen on irrigational facilities being extended to them by Government since the present enquiry has been on foot.

C.—CANALS.

12. Q. There are only two forms of small intermittent canal irrigation in Bilaspur:—

(a) Where a small stream is banked up in September and the water is made to flow into the rice fields lying along its side, only one watering is given; the practice is a new one to the best of my knowledge.

(b) The *thar* or irrigation channel taken from a distant stream by embanking it and carrying the channel along contours and even through small cuttings where ground is suitable. Here only one watering is given so far as I am aware, or two at most and those only in September and October. In a year of ample rainfall the supply is not usually required at all. In a year of scanty rainfall or in a year of drought, more than one watering is not often given. Late-ripening rice sometimes receives a second watering.

D.—TANKS.

23. Q. (1) *Bilaspur.*—Tanks are built on two plans. Far the most common is to have two long arms stretching above the tank to catch the water. This forms a reservoir. Here the silt settles and irrigation is more usually performed from the reservoir as it is higher up the slope. The water in the tank, which is deeper, is usually used for drinking and watering cattle.

The more intelligent cultivators will occasionally lay out contour channels to bring water into the tank. In the black soil of Mungeli, in which slopes are very long and gradual, a reservoir often is 20 to 30 acres in extent, and after the water has been taken out of the reservoir, wheat or gram is sown in it. Curiously enough it is the exception to find the opening between the tank and reservoir filled up. A few intelligent men have a stone channel or pipe which they open or close at will. Tank building is far less intelligently practised in the black-soil tracts than in the yellow-soil villages in the east of Bilaspur. The other way is to cut back into a slope a tank with a single chamber, of which all the water is used for irrigation.

Tank building in Hoshangabad is usually very unintelligent.

(2) Water is almost always taken out of the tank by cutting a hole in the bank. It is then allowed to go from field to field, till the *malguzar* or other owner of the tank whose fields are below it has had all he wants; then the other people take their chance. Each field is filled as deep as the owner thinks necessary; then the lower bank is cut, and the next field gets

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its share. If water has to go to a distant field, the owner of that field persuades the owners of intermediate fields to allow him to make a channel along the edge of the field.

Sometimes fields benefit by incidental irrigation, so to speak, either by the back-flow from a reservoir or by percolation.

(3) See Question 12. The only exception is in case of sugarcane fields, which receive numerous waterings in the open season.

(4) In the black-soil tract tanks are usually small; and the area irrigated when the fullest possible use is made of the water as in 1896-97 averages some 40 acres. It must be remembered that irrigation is the exception rather than the rule, and in a season of average rainfall no one will cut the tanks. This custom has changed a good deal in the last few years, but the tanks still contain the main drinking supply, and the people do not cut them except under great stress. In the yellow-soil tracts in the east of the district much larger tracts are irrigated in a year like 1893-97. I should imagine the average would run up to 80 acres. Many tanks irrigate far larger areas.

24. Q. (1) There are the following classes of soil in Bilaspur:—

(1) Kanhar, 1st class black.

(2) Dorsa I, 2nd class black.

(3) Dorsa II, stony black soil, a good deal mixed with pebbles, sand or yellow soil.

(4) Matasi, yellow soil.

(5) Bhata, pebbly red soil.

(1) and (2) will grow a double-crop almost always.

(3) and (4) will grow a double-crop if irrigated, unless in very sloping positions.

(2) The heavier varieties of rice can be grown by help of irrigation. Even with only the manuring usually given already to the better class fields, effective irrigation will double the yield over a series of years; that is, will raise it from 10 or 12-fold to 20-fold, as the heavy late-ripening rices give much more outturn than the lighter ones when both are at their best. Again, with irrigation the land could be ploughed up after reaping rice and wheat sown instead of broadcasting pulses in the mud as at present.

(3) As already stated, in an average field the yield could be doubled. In a very poor field the yield could be more than doubled; in a very good field, I doubt if it would be increased at all. Similarly, in a year of ample rainfall unless the very best varieties of rice were grown and a superior style of double cropping introduced, irrigation would be of no good in any but the poorer fields. Supposing existing methods and crops were maintained in a year of scanty rainfall, it would raise the produce of the best fields by 25 per cent., of the two average fields by 100 per cent., and of the poorer fields by an indefinite amount, for they would yield very little indeed unirrigated.

In a year of drought the produce of the better fields would be raised by 50 per cent., of the average fields by 500 per cent. or so at the least, and of the poorer fields by an indefinite amount.

25. Q. I cannot say.

26. Q. No.

27. Q. I exclude the best fields in all cases, for they are not numerous; and I take the average fields simply.

A fair average black-soil field, one acre, would produce unirrigated—

	Rs.
6 khandis Bakur rice, value	12
+ 250 lbs. pulse, value	8
Total	20

If irrigated would produce—

12 khandis Gurmatia rice, value	26
+ 450 lbs. wheat, value	14
Total	40

situated in a tract where cultivation is more skillful and manuring more practised than the black-soil field.

Unirrigated.

Average yellow-soil field—This field is probably 7 khandis Manjhla rice, value Rs. 14.

If irrigated, would produce—

	Rs.
14 khandis Gurmatia rice, value	30
+ 300 lbs. inferior pulse, say, urad, value	8
Total	38

I assume in the above that irrigation can be advantageously practised in black soil. But I greatly doubt this and perhaps a more probable estimate of a black-soil irrigated field is—

	Rs.
8 khandis Gurmatia, value	18
+ 450 lbs. wheat, value	14
Total	32

(2) In a year of drought the black-soil field would produce about twice the seed only on the analogy of 1897 and no double-crop.

Result 1½ khandis of rice, at famine prices about Rs. 5.

The amount produced by irrigation would presumably be the same as in an ordinary year, while prices will double. Result Rs. 80.

Unirrigated.—In an average yellow-soil field the produce would equal the seed or about Rs. 2-3-0.

Irrigated.—The value of produce would be Rs. 76.

In 20 years in Bilaspur, we get about three driest years, three wet years, three average years.

In driest years profit would be for yellow soil about 200 per cent. (not in years of drought as above.)

In wet years profit would be very small. In average years it would be 100 per cent.

Tank irrigation in Hoshangabad is practically unknown.

28. Q. Irrigation in the Mungeli tahsil is practised only in years of short rainfall, and the landlord usually takes all the water he can use, but lets the tenants have what is left free.

There is a very strong feeling against a malguzar who charges water-rate; and I have never discovered an instance of it save once in 1896-97, where a charge of a rupee for about one-and-a-half acres was made. But I believe in villages in the east of the district where irrigation is regularly practised, regular water-rates are charged. But I have never had an opportunity of seeing any such cases.

29. Q. Practically none. A proper system of distribution would entail the maintenance of small channels, which could be easily done by joint village labour. Local sentiment would favour this in Chhatisgarh, but supervision would be needed.

30. Q. By annual village labour; the whole village turns out and works together. A few of the existing tanks are worth protecting and they might be provided for by legislation.

In Sheorinarain tahsil the tanks get cleaned out by cultivators of surroundings fields, who carry off the mud to manure their fields with.

At present the cleaning is practically nil in the black-soil tract. I could give no estimate for it anywhere, as it is done in the most haphazard fashion.

31. Q. The private owner is absolutely master of the situation, and his permission has to be obtained before the tank is cut.

In famine years or years of drought quarrels are frequent. I think it would be a good idea to legislate providing that in years of drought at any rate any such quarrel should be referred to the Deputy Commissioner (as is provided in the Sambalpur village custom roll), and he should have power to order the opening of the tank on payment of such compensation as he may determine.

32. Q. Provided that such a measure will not lead to the neglect of a comprehensive scheme of canal irrigation, which is possible and necessary in my opinion. I think private persons should be encouraged to build tanks, for which there is an indefinite further scope. I would offer more favourable terms to persons who will provide proper sluices or pipes for taking off water. I think the famine loans of 1896-97 are as good a system as can be devised.

33. Q. In yellow soil not much practical inconvenience is caused, as the reservoir system helps to prevent this. I should say it takes at least 50 or 60 years to deposit 2½ feet, from a tank I observed at Man in Mungeli. In black soil, the banks settle down and more silt comes in. I could not form an esti-

date, but if intended I should say the average tank would become useless in about 100 years or so. See also Question 30. The last five questions refer solely to Bilaspur.

E.—WELLS.

34. Q. In Bilaspur but little well irrigation is practised for other than garden vegetables, and this over no large tracts, but only in very small patches along the edge of streams in wells not more than 15 feet deep. I saw in 1899 the people digging wells about 8 feet deep and watering their rice, just close to Bilaspur itself: this saved about half the normal crop.

The question is more important for Hoshangabad.

(1) There are very few permanent wells used for irrigation except of gardens. They are usually about 30 feet deep. A great many temporary wells are used.

(2) The wells are in almost all cases situated in sandy ground or ground with a substratum of sand near a river: and are, I should imagine, in all cases—certainly everywhere east of the Talwa—fed by percolation. In Zamani, Seoni, and Timarni they may perhaps be fed by springs. The Sohagpur wells (temporary) did not fail to any great extent even in 1899-1900.

(3) About 500 such wells are always made by the well-to-do.

(4) Not known.

(5) By *dhenkila* or dipping-lift when quite shallow in temporary wells: by *rahat* or wheel in wide temporary pits: by *mot* in temporary wells and in all permanent wells.

(6) For wheat, from 5 to 8 acres. For vegetables, 3 or 4 acres.

(7) As wells are always made afresh every year, the area would be the same as in the last answer.

35. Q. (1) Except in the case of vegetable cultivation, where crop after crop is taken all the year round, the only case where a double-crop is taken is where a rain crop of *sauan*, *tilli*, or *bajra* is grown: the land is then irrigated and ploughed and wheat is sown.

(2) The sowing of wheat or any rabi crop would often be impossible in such land without irrigation, which is as often as not very sandy.

(3) Where wheat is irrigated in black soil, I doubt if there is any particular advantage in irrigation in a year of ample rainfall. In sandy soil no doubt irrigation would be beneficial. In a year of scanty rainfall, the yield would be increased from 400 lbs. to 800 lbs. in black soil.

In a year of drought the yield would be increased from 250 lbs. to 800 lbs.

36. Q. The saving made by irrigation partly arises from the fact that only about one-third of the normal seed is needed in an irrigated field.

Over an average term of years, I should put down the increase of yield as from 400 lbs. to 800 lbs., seeing that irrigated fields are usually poor, and the district average of 50 lbs., mostly refers to black soil. This would represent, at 32 lbs. to the rupee, Rs. 12-8.

In a year of drought, the increase would be from 250 lbs. to 800 lbs., or 550 lbs., which, at the probably enhanced price of 20 lbs. to the rupee, would amount to Rs. 27-8.

(The President.)—How long have you been the Deputy Commissioner of Hoshangabad?—Since the beginning of August last. I was there as Settlement Officer for nearly a year before that.

1. Q. Before that you were in Bilaspur?—Yes.

2. Q. You have had much famine experience?—I have been through the two famines in Bilaspur.

3. Q. You say in reply to paragraph 1 of Question 3: "The size of holdings in Bilaspur has decreased about 10 per cent. in 12 years, and should be small enough to admit of very close cultivation in 30 years' time." Does that mean that the population has increased?—Yes. But it has gone down just now on account of famine, but that is purely a temporary thing.

4. Q. The only reason for the increase of population would be, I presume, the increase in the immigrant population?—In the particular part that I was concerned with, there was no immigrant population.

5. Q. It was a natural growth of the population?—Yes. There was a great deal of immigrant population in the other parts, but not in the part that I was concerned with.

37. Q. (1) In Bilaspur little or nothing. In Hoshangabad 100 per cent. more on account of land being capable of a well. When a permanent well was made by the landlord I found land letting at 300 per cent. enhancement. The rates might be stated thus:—

Unirrigated sahra, Re. 0-12-0 to Re. 1.

Sahra with water-bearing stratum, Rs. 2.

Sahra of good quality with permanent well, Rs. 5 to Rs. 6.

(2) The enhancement would in all cases be proportionate to the rent paid to the owner.

On the total area.

38. Q. No, because hitherto there have been only two kinds of well construction for irrigation, (a) temporary wells, which cover $\frac{1}{8}$ of the well irrigation of the district, and these are always made in certain tracts, where irrigation is known to be possible; (b) permanent wells in a few well-to-do persons' gardens. I believe that many years ago there were in the Charwa tract, no doubt elsewhere, brick wells of a cheap kind, which were used to irrigate sugarcane and rice, &c. Since the influx of prosperity consequent on the coming of the railway, this kind of cultivation has been abandoned by the ryots, who buy imported rice and gur. No extraneous help has ever been given. I would recommend a few trial borings in the *haveli* or black-soil plain, and the making of one or two experimental wells of brick by Government. These might be worked by the Agricultural Department by arrangement with the owners of the land for a year or two. All spots where temporary wells can be made are well known and fairly well used by the people already. No widespread system of well irrigation will be possible unless the black-soil area is provided for: and here brick wells will be needed, as temporary wells will not stand.

39. Q. I do not think Government should do anything in the matter until the results of the scheme sketched out in the last answer have been tried over a term of years. When this has been done, subject to the results of the experiment, I think Government might make a limited number of wells in selected localities with a view to spreading the custom; but I would deprecate any attempt at providing a wholesale set of Government wells; I would allow tenants to buy up the wells by payments spread over a term of years. We have not the machinery to realize a widespread series of petty items of water-rate.

40. Q. There are a great many temporary wells as will have been gathered from previous answers. They are an almost perfect protection against drought east of the Tawa. In the extreme west of the district they afford less complete protection. Their construction in a year of scanty rainfall would be encouraged—

(i) by the grant of *takavi* to buy cattle to work the well, as these wells usually belong to the poorer castes;

(ii) by free grant of wood from Government depôts or jungles;

(iii) by personal advice and precept.

Wells are quite cheap and easy to make, but the ordinary cultivating castes, who are not used to this kind of work, shrink from the labour it involves; the ordinary cultivating castes of this district are unusually lazy and dislike prolonged heavy labour.

6. Q. (Mr. Muir-Mackenzie.)—Where from?—There was immigration from Rewah and northern zamindari. I do not know those parts.

7. Q. In reply to paragraph 4 of Question 3 you raise the subject of black cotton soil which meets us everywhere. You say "In Bilaspur my experience went to show that irrigation of rice in black cotton soil was only practised by the people in about one year in four, and then only when the September rainfall was short." That is only when the rains fail?—Yes. The black cotton soil of Bilaspur is more irritable than the black cotton soil of Hoshangabad, I should say by the look of it.

8. Q. As regards Hoshangabad, do they ever irrigate black cotton soil? Did they do it in the time of the recent drought?—They do irrigate black cotton soil from wells, I am bound to admit. As a rule where there are wells there is usually a sandy substratum, usually, but not always. Of course that means there is some mixture of sand in the soil.

9. Q. (Mr. Muir-Mackenzie.)—Also the soil is well drained?—Must be of course.

10. Q. (The President.)—You mean then that they do not bore wells in black cotton soil, pure and simple?

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—They bore wells in certain places where the water substratum is pretty near the surface. That means, of course, that there is a special kind of soil near it.

11. Q. I suppose you would not irrigate black cotton soil under all wells?—No. The majority of irrigation from wells is in sehar or sandy soils, in all the various grades between purely sandy soil and black soil.

12. Q. The bulk of your district consists of black soil?—By far the greater bulk.

13. Q. I suppose that even if it were possible from a technical point of view to create a canal through the district, water would not be freely taken?—I think if the Government started an Agricultural Department you can make people do a great deal more in the way of taking water and striking out new lands than the people seem now to do generally.

14. Q. That refers to agricultural education?—I do not think that you can do it without it. I think it is worth having something of that sort when you can get such a big result as that.

15. Q. You have some rice cultivation in Hoshangabad?—About 10,000 acres. It used to be 19,000 or 20,000 in normal years.

16. Q. I notice in Mr. Harriott's map the extent of rice cultivation in Hoshangabad?—The bulk of the rice cultivation in Hoshangabad is on the banks of the Tawa river. There is a certain amount of rice in all those sub-montane villages.

17. Q. No tanks?—No. There is irrigation from only one tank in this district. I cannot recollect what was irrigated. I think it was rice, but I am not sure about it. I think it is near *Bandkari*.

18. Q. Do you think that the absence of tanks is due to physical causes that the country does not lend itself to tanks?—I do not think it is easy to make tanks in black soil.

19. Q. These rice plots that you have mentioned, are they in black soil?—No.

20. Q. Can one make tanks in them?—You can make tanks along-side the Tawa. The black soil lies high and you suddenly go down a steep bank of 60 or 80 feet and underneath lies what looks like black cotton soil but is really alluvial or semi-sandy soil. On this *kabar* rice is grown—a very poor kind of rice cultivation. At the foot of the steep slope there will be facilities for tanks. You get a water-worn channel running back into the high land, you can bund that up and make a tank.

21. Q. Do you think *malguzars* would make tanks?—I do not think so. The *malguzars* of this particular district are particularly unenergetic. They are afraid of making tanks, but they will make *bandhias*.

22. Q. What are *bahra* fields to which you refer in paragraph 4 of Question 3?—Fields lying in lips.

23. Q. What is the means of protecting black cotton country against famine?—I think you can irrigate rice in black cotton soil in good many years. I do not think that you can irrigate it every year by any means. I think there are some years with so much rainfall that it would be possibly harmful to irrigate rice in black cotton soil. On the other hand, there are good many years in which it will do a little good, while there are other years in which it will do a great deal of good. In wheat land I do not think there is anything else to do except embankments. That would afford a modified measure of protection.

24. Q. Is there much of that in your district?—Very little. I hope to have some more shortly.

25. Q. Do they grow rice at all inside these embankments?—I should say they grow wheat in rice embankments rather than rice in wheat embankment. They have rice in poor low-lying grounds and they grow wheat as a second crop after rice. They are not regular wheat embankments.

26. Q. Do you imagine that, if Government were to make a few tanks in the district, the land below them would be taken up for rice?—Yes, in sub-montane tracts. The only thing is I do not know if you could have a high enough of standard of rice growing to pay a decent rate, unless the Government gave a little agricultural education to the people. I think it would be easy to do that.

27. Q. They would only be willing to pay very little?—Yes, until they learn to grow a good class of rice.

28. Q. You say in reply to paragraph 9 of Question 8: "In Chhattisgarh it is unlikely that the people will ever help themselves much in starting irrigation by making tanks, owing to the fact that the holdings are so scattered." It is owing to the *Lakhabata* system?—It is the remains of *Lakhabata* system which does not however exist now.

29. Q. How are the holdings in Hoshangabad?—The holdings are usually pretty compact.

30. Q. So that the *Lakhabata* system has ceased to exist?—You have tenants doing everything to change the fields and the present tendency is to get their holdings more compact. They are gradually making them more compact but it will be a very long job.

31. Q. As regards *takavi* advances you say in reply to Question 5: "What is needed then is (i) encouragement to take loans, (ii) to induce united action, (iii) to allow a deduction from the amount to be repaid in order to lessen the apparently unprofitable nature of the transaction to some extent." This is as regards loans for embanking fields?—Yes.

32. Q. Do several *malguzars* unite in a thing like that?—I did not mean several *malguzars*. I meant several people in one village. It is so much cheaper for 4 or 5 to embank fields than for one man to do it.

33. Q. Would not tenants do it?—I have got several tenants to do it this year.

34. Q. On advances I suppose?—Yes. My recommendation for remitting a small amount of the principal is only with a view to get it started.

35. Q. Would it not have a good effect in the same direction to say that you would not require any payment of money until it has been started for a few years?—That would be a possible inducement. I have postponed all repayments until June 1903 which people seemed rather to like.

36. Q. Did you give out much in the way of loans?—They practically gave out nothing for a long time except famine loans. I have given out Rs. 7,000 or 8,000 just now. I hoped to get out more but there was some local intrigue in one particular place and that had a bad result.

37. Q. According to Mr. Sly's note the loans advanced in Hoshangabad since 1890-91 come to less than Rs. 3,000 a year?—Yes, they have not been pushed.

38. Q. Do people know that they can get loans?—They are getting to know them now. I have been advertising it. I used to get people together in the evenings when I had a spare hour or two, when I talked to them usually about agricultural subjects and specially about wheat embankments. Very often I would get an application then and there. Within one or two years more people would be more ready to spend money.

39. Q. Do you get money freely given you by Government to spend?—Yes.

40. Q. This year how much do you calculate to spend?—Rs. 15,000. I should have spent it if it had not been for this little *contretemps* to which I referred. I shall not be able to spend more than ten or twelve thousand rupees. I have spent so far only Rs. 8,000.

41. Q. If you or your subordinate officers had more time to attend to the thing you could have given out more money?—Certainly. If I had more time I could have given out more money, because sometimes I might have to argue with them to get them to appreciate the benefits of the thing.

42. Q. Would you advocate having a special Deputy Collector or a *Tahsildar* or a man of that sort of position attached to your district for the time being?—Yes, if you can get a man whose honesty is above suspicion.

43. Q. You say in reply to Question 5 "In 1896-97 I gave out loans fixing certain periods of repayment in almost all cases less than 10 years. The period was subsequent to the taking of the loan shortened by the orders of the higher authority for reasons unknown to me, while I was absent from India." That is to say you told them that they could repay them in 10 years, but your successors asked them to repay them in 7 years?—So the people told me.

(The President.)—That is strange.

(Mr. Craddock.)—The period prescribed was 7 years.

Witness.—It was prescribed subsequently but not at the time the loan was given out.

44. Q. (The President.)—It is a monstrous thing?—Yes, it is a monstrous thing. It looks like a misunderstanding?

(Mr. Craddock.)—I don't think that the fact was brought to notice at the time.

45. Q. (The President.)—You say "This caused much discontent and many recipients of *takavi* stated that they would not take any more." Naturally that will be the result. I suppose that goes on still?—Yes.

46. Q. You would like to see it set right?—I am not in the Bilaspur district now, but I should very much like to see it put right.

47. Q. (The President.)—I can quite see that such a thing as this shakes the confidence of the people in the *takavi* system.

(Mr. Muir-Mackenzie.)—In another province when the first instalment had been paid and before the second instalment could be given, orders came down to cut down the allotment, so that the second instalment was not given. Occasionally things of this sort do happen.

48. Q. (Mr. Rajaratna Mudaliar.)—In this particular case it may be that the money was not properly spent.

Witness.—It was a general order.

49. Q. (The President.)—Bilaspur is largely supplied with private tanks?—Yes. Not largely in proportion to what might be, but largely as compared with other districts.

50. Q. Would you advocate the introduction of Government tanks or do you think it best to go on with the system of giving advances to *malguzars* to make their tanks?—I would not advocate small Government tanks, but anything on a big scale will have to be made by Government.

51. Q. Do you think it would be possible to arrange for really large reservoirs being made up by Government not so much with the object of direct irrigation as to feed these minor tanks when they run low?—That is of course an engineering question. It is hardly possible for me to answer it.

52. Q. Suppose there are no engineering difficulties what do you say?—That will be a very good thing.

53. Q. Then the Government will have to deal with *malguzars* and not with *ryots*. I presume that is what it would come to?—Yes. But you would have to make the *malguzar* agree to let the water go out to other people's fields as well as his own. If he took it on that condition, it would be all right. At present in famine years or years of drought, there is a lot of friction about these tanks. *Malguzars* try to keep the water to their fields as much as possible and do not let it go to other fields.

54. Q. Generally speaking, as far as I understand, the *malguzar* does not get very much benefit from supplying water to tenants. They don't pay very much for it?—In places where irrigation is regularly practised no doubt he does get some benefit but not much. In places where irrigation is unusual they think it wrong to cut the tank and they do not generally do it except under great necessity. They also think it wrong to charge for water in *Mungeli*. I am only speaking of *Mungeli* which is a black soil district. I do not know yellow soil; they regularly cut the tanks in the yellow soil part of the country.

55. Q. Are there proper sluices to these tanks?—I have seen one or two in *Raipur*, but not in *Bilaspur*. A *malguzar* made a sluice with regard to one of the tanks in 1899-1900. I told him that we made the tank and asked him if he would just put the sluice and he did it.

56. Q. Your figures show that there is a distinct profit from the *malguzar* irrigating his rice. In reply to paragraph 2 of the Question 24 you say "The heavier varieties of rice can be grown by help of irrigation. Even with only the manuring usually given already to the better class fields, effective irrigation will double the yield over a series of years; that is, will raise it from 10 or 12-fold to 20-fold, as the heavy late-ripening rices give much more outturn than the lighter ones when both are at their best. Again, with irrigation the land could be ploughed up after reaping rice and wheat sown instead of broadcasting pulses in the mud as at present." If the *malguzar* knew his own interest he will always go in for irrigating rice. You say in reply to paragraph 4 of Question 23 "It must be remembered that irrigation is the exception rather than the rule, and in a season of average rainfall no one will cut the tanks." Yet in these seasons if the *malguzar* did boldly cut the tank and irrigate land, he would get more profit?—Yes, I think I can account for it to some extent. Partly, *Chhattisgarh* is unusually slow to move even for this country in the matter of adopting improvements. The district has been land-locked until about 15 or 16 years ago, I think until 1882. Then the railway was opened and the people had a great impetus given in increasing their agricultural outturn and began to sow heavy rice *Gurmatia*. They had a very long cycle of wet years when *Gurmatia* rice did well. I remember hearing it said in 1895-96 and 1896-97 that one reason why the famine was particularly severe was because people had increased the growing of *Gurmatia* rice. It is

much more likely that it would have been much more hit by the famine than if it had lighter rice. People told me that in 1896-97 the growing of *Gurmatia* rice had been very little increased. They dropped it like red hot coal when the famine came.

57. Q. (Mr. Muir-Mackenzie.)—Has the growing of that rice gradually diminished since 1896-97?—Yes, even seeds could not be had. Finer rice was used to be grown in several villages, but it has now disappeared almost entirely.

58. Q. (The President.)—In reply to paragraph 2 of Question 27 "In 20 years in *Bilaspur*, we get about 3 driest years, 3 wet years, 3 average years?"—It is a misprint. Twenty ought to be 9. It must be 3 dryish years, 3 wet years, 3 average years.

59. Q. In reply to Question 30 "How is the maintenance provided for tanks," you say "by annual village labour; the whole village turns out and works together." There have been several new tanks made by Government?—Yes.

60. Q. Are they maintained in the same way? Probably they do not require much maintenance?—I have had several requests from men to be recorded as the man who cleans the tank and who is allowed to make *snadi* of tanks.

61. Q. Have you recorded it?—No.

62. Q. Would he claim anything in return?—He would claim water. I used to tell them that it is the *ryots'* tanks and the *ryots* must clean it. If it is a *malguzari* tank and if we repaired it, it was with the distinct understanding that we must not interfere with his rights.

63. Q. We found in *Hyderabad* that a man of some local standing and hereditary position, if possible, undertook to keep the tank in order for a payment of one-tenth of the revenue of the year and that payment was partly made to him in the shape of a bit of land which he had free of assessment and then he took the dignity and the position of *muafidar* and he was very glad to go on keeping the tank in order on those terms. Do you think that something of that sort would work here?—They have been pretty slack about repairing tanks here.

64. Q. Not pretty slack, but extremely slack?—Yes. The way in which the tanks are repaired in the yellow soil part of *Bilaspur* district is that they clear the silt in the tank and take it away for manuring their fields. This was in *Gorgegarh* tahsil.

65. Q. I am thinking of the repairing of bunds and preventing them from coming to grief?—That is very rarely done.

66. Q. In reply to Question 31 you say "The private owner is absolutely master of the situation, and his permission has to be obtained before the tank is cut. In famine years or years of drought quarrels are frequent. I think it would be a good idea to legislate providing that in years of drought at any rate any such quarrel should be referred to the Deputy Commissioner (as is provided in the *Sambalpur* village custom roll.) What is that roll?—That is the *Wajib-ul-arz*.

67. Q. That can be modified from time to time?—Theoretically it represents the existing village custom but practically you can modify it very considerably at settlement.

68. Q. You think it would be desirable to legislate to give authority to Deputy Commissioners in times of drought to use the water of tanks on public grounds?—Either legislate or put it in the *Wajib-ul-arz*.

69. Q. Have you practical experience of cases where legislation of that kind would be of some use?—Yes.

70. Q. It seems to me very important to have such a power at a time of crisis?—There were numerous cases of assault in the end of 1896, numerous cases of whole villages turning out with sticks. There was one *malguzar* who was the worst of that class and who would not give water to anybody unless he paid for it. Those who could not pay did not get water. There were some people to whom he would not give water even on payment.

71. Q. Did they assault him?—No, the police was too much with him.

72. Q. In reply to Question 32 which deals with the question of private tanks you say that a comprehensive scheme of canal irrigation is possible and necessary in your opinion. You distinctly advocate Government irrigation on a large scale?—I should like to correct the word "canal." I meant irrigation on a big scale.

73. Q. (Mr. Muir-Mackenzie.)—That is to say in *Bilaspur*?—Yes.

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74. Q. (The President.)—In reply to Question 36, you say "The saving made by irrigation partly arises from the fact that only about one-third of the normal seed is needed in an irrigation field." That is a very important fact. Is that recognised everywhere?—What people tell you varies in amounts. Sometimes it is one-half and sometimes it is one-third. The germination is very much better, of course.

75. Q. There do not seem to be a large number of permanent wells in Hoshangabad?—The figure is given in Mr. Sly's note. They do not construct permanent wells in order to grow wheat. They make temporary wells for wheat.

76. Q. Judging from what you say here "Wells are always made afresh every year." I infer that these must be temporary wells?—Yes. Mr. Sly says that the number of durable wells has increased from 493 in 1890-91 to 747 in 1900-01. The number of temporary wells rose during the same period from 635 to 1,073, that is since 1890-91, I should imagine that if the figures are incorrect, they err on the side of omission.

77. Q. You say in reply to Question 37 "In Hoshangabad 100 per cent. more on account of land being capable of a well. When a permanent well was made by the landlord I found land letting at 300 per cent. enhancement." That is a tremendous difference?—Yes. It is one of my Court of Wards' villages, I say what the man offered to give.

78. Q. (Mr. Muir-Mackenzie.)—You mean that the man actually offered to give him 300 per cent. enhancement?—Yes. Four times what similar land would pay which is unirrigated and without a well.

79. Q. Can you tell me anything about the depth of the well?—I did not look into it. It is a Court of Wards' well.

80. Q. (The President.)—In reply to Question 40 you say "There are a great many temporary wells as will have been gathered from previous answers. They are an almost perfect protection against drought east of the Tawa. In the extreme west of the district they afford less complete protection. Their construction in a year of scanty rainfall would be encouraged: . . . by free grant of wood from Government depôts or jungles." What is it for?—To make the top part after you make the *môte*.

81. Q. It does not cost much?—In some villages it would cost Rs. 3 or 4, but it would cost Government nothing.

82. Q. You say "Wells are quite cheap and easy to make but the ordinary cultivating castes, who are not used to this kind of work, shrink from the labour it involves." You mean in Bilaspur?—In Hoshangabad.

83. Q. Do you know what the famine works programme is for your district?—I am beginning to make one.

84. Q. There was one before?—Do you mean village works programme?

85. Q. I mean a programme of relief works altogether to employ labour upon?—I expect that the Public Works Department have got one for bigger works.

86. Q. Don't they prepare it in consultation with you as to the number of men to be employed and such details?—I suppose they would. I am afraid that the matter has escaped my notice.

87. Q. It would be well to look it up?—Yes.

88. Q. (Mr. Higham.)—You recommend in Bilaspur that Government should make tanks when they are of a considerable size?—Yes.

89. Q. Serving how many villages? Supposing it served more than one village should the tank be made by Government?—I should say that the tank should serve regularly every year more than 400 or 500 acres. The land may be in more than one village.

90. Q. You say that any tank irrigating more than 500 acres should be constructed by Government?—Yes.

91. Q. Irrespective of the number of villages?—Yes.

92. Q. Suppose a tank is to irrigate 400 acres, if they were to be in 2 villages, would there not be a difficulty in getting it done by the people? If the irrigable area was less than 500 acres, you would not recommend the Government taking up the tank. Would the malguzar make such a tank if it irrigated more than one village?—The difficulty occurs when the tank is in one village and a large proportion of the irrigable area is in another village. I don't think there would be much difficulty, as a rule, which could not be overcome by little personal persuasion. It only

depends upon the fact whether you would like to take the trouble or not.

93. Q. For all tanks irrigating less than 500 acres, you recommend that people should make them themselves?—Yes, with the help of *takavi*, if necessary.

94. Q. Are there not great many difficulties in people making them themselves apart from want of money?—Yes. There is the difficulty about holdings being scattered, there is the difficulty about acquiring the land for the site of the tank and sometimes there is the difficulty of bringing the water along a contour.

95. Q. You mean other men's land?—Yes. I always try to induce men to bring water along a contour. But one has a lot of trouble to get people to let them do it.

96. Q. As regards sub-division of lands, I understand that you do not recommend anything in the shape of legislation to get over that difficulty. I refer to your answer to paragraph 9 of Question 3?—I don't think I have gone against it. I have simply said that legislation to permit of compulsory exchanges of land fields between different holders would result in a great extension of tank building, but would be liable to many abuses no doubt.

97. Q. If it would result in a great extension of tank building it might be an advantage to legislate?—I would recommend it. But it wants very very careful looking into, because it would offer excuse for ousting the tenant from his land, if you pretend you are going to make a tank or if you make a tank. I have known cases in which men make a tank simply to worry the tenants and cause inconvenience to them. Of course these cases are exceptional, but yet it is a thing which should be carefully watched.

98. Q. You think that with proper safeguards legislation is desirable?—Yes.

99. Q. You want legislation to take up lands?—Yes. You should declare it that the land should be acquired for this purpose.

100. Q. As matters stand at present can you not acquire what is private land for a public purpose?—Yes. But this is not for a public purpose; it is for the good of the village community.

101. Q. Have you known lands taken up for tank under the Act in that way?—No. My Deputy Commissioner, when I was Assistant Commissioner in 1897, proposed to Government to take up an area in the village of a very objectionable malguzar who would not do anything for his tenants, to acquire a site for the tank, to acquire the land under the tank and to make it a ryotwari village. But the proposal was negatived because they said that it was not a public purpose.

102. Q. The only way you can proceed in such cases would be to ask the Government to make the tank itself?—You cannot call it a public purpose.

103. Q. If the Government make a tank as an irrigation work, it will be a public work like a canal, but they will have to charge water-rate in such cases?—It would be open to argument whether the land is taken for a public purpose or not.

104. Q. It does not differ in any way from any large irrigation work such as a canal for which we take miles of land?—The question is rather beyond me.

105. Q. If the tanks are made by the people, I do not think the Government could help them to acquire the land as the law stands at present. If they are made by Government, I do not think there would be any difficulty?—I think it would be a pity for Government to make the small tanks, because it would require an enormous amount of supervision, scattered supervision of the hardest sort; and if the Government made them there will be the question of maintenance.

106. Q. I quite agree that would be a great pity. I do not mean to propose that the Government should make them. I want to find out what obstacles there are in the way of people making them so that they may be removed?—You must have legislation which would admit of the village community either through the malguzar or through a committee which could be constituted, acquiring the site for the purpose. The village committee of Chhattisgarh is a real living force and it is distinctly important although it is not recognised. The land would be taken up for the tank and they would arrange for the exchange of land if necessary.

107. Q. That is all that could be done by a village committee if power were given to them?—Yes. The malguzar and the village committee would act together. There is no organised village committee, as I understand there is in Madras, so that you will have formally to appoint a committee.

would you go about the work?—If I were the Deputy Commissioner I would go to the village and call the people in the afternoon and ask them "Is there any good site for a tank in your village?" The people can always tell you that; it is a thing which they know in a minute. You might ask them why they do not make a tank there and they tell you the objections. You meet them as far as possible and persuade them to take *takavi*. You make a note in your note book of the action that is required in the way of acquiring land, exchanging bits of land and then you leave the committee of the village, under the guidance of a subordinate officer if necessary, to work out the details. In the meantime you should put up the *takavi* proclamation so that in about 15 or 16 days the men should have their money.

109. Q. I think almost all the private tanks that are now in existence have been made by malguzars. Is it not so?—A majority of them have been made by them.

110. Q. They are the property of malguzars?—Many more are the property of the malguzars than those made by them. Suppose a man makes a tank for a religious purpose (*punyam*) and he dies without any heir, the malguzar in some way or other ousts anybody that may come to claim the tank and eventually it comes into his hands.

111. Q. If you are to make new tanks, your advance will not be made to the malguzar inasmuch as the tanks would be made by the whole village and not by the malguzar?—I tried to make advances to the ryots of two villages to enable them to make tanks, but I found it a most frightful and difficult job. I had everything in my favour. It was an absentee malguzar whom they thoroughly disliked. It was very hard to fix a joint site and when I did it there was a tremendous difficulty. Only one of those two villages eventually came forward to build the tank. I gave them the money but they did not build it very well. If I had been able to give more personal attention to it, I should have made it more of a success. It is a very difficult job to deal with tenants without the malguzar, for anything that wants continuous action.

112. Q. Then you will have to operate always through the malguzar?—I should try to work it through the ryots ultimately. I should try to lead up to that if I could.

113. Q. You say in answer to Question 31 "The private owner is absolutely master of the situation, and his permission has to be obtained before the tank is cut." You propose legislation to enable you to cut the tank, I suppose that would be interfering with private property in the case of all tanks that have been constructed by the malguzar?—Yes, it would be. But I think local public opinion would support the Government in doing so.

114. Q. What I am thinking is if new tanks are made, it would be desirable that all the people whose lands would be commanded by them should be shareholders in them and not that the thing should be thrown into the hands of malguzars. Is it not?—Quite so. I should like to see a few rayati tanks made if possible. Our efforts should be directed towards that object, though the construction of tanks would not be easy and it would be easier to work the thing through the malguzar. I should make every endeavour to push the construction of rayati tanks.

115. Q. It would require a great deal of management and supervision to work it in that way?—I would select one or two villages where the rayati community is unusually strong.

116. Q. Where there is no personal interest, if the system of giving advances for making tanks were carried out, advances would be generally given to malguzars?—Yes. There is another difficulty which is found in Sambalpur. You can make a little tank to irrigate little plots of fields belonging more or less to one man. They make little tanks at the head of Bahal in Bilaspur. They do not get so many Bahals and if they get them they are much bigger and they have got usually long slopes and on these they make long embankments. You get a lot of different people's land underneath it. Those people whose land is underneath it would join together and people whose land is not there would not join. If you get a tank which will command one man's land, that man would do his best to get it made if it is in his land. If it is in everybody's land, it would be difficult to make it unless it benefited the whole community; and even if it should benefit 10 or 12 people it would not be allowed.

120. Q. One of our witnesses proposed that instead of giving any exemption of that sort the best way to proceed would be to offer a grant-in-aid on the condition that the people who would be interested and whose lands would be protected should contribute the balance of the sum required either in the form of their own labour or in cash and in that way it would be possible to get tanks made?—Where you take labour from them—and the thing cannot be done without labour—it would be a very awkward job to enforce that labour.

121. Q. They say that has been tried in the case of some of the village works—sanitary wells?—My experience of it is only in my district. It is anything but a success.

122. Q. Then you think that the only way to go to work is to offer an *inamdari*?—Yes, what they call "tukum." That has very often been suggested to me by a malguzar in Bilaspur.

123. Q. With regard to rabi embankments, what amount do you think could be got rid of in the shape of advances in Hoshangabad district on such works?—If I had that to do and nothing else and if seasons were favourable I think I could probably get out thirty or forty thousand rupees a year without much trouble.

124. Q. Up to date there have been only five or six thousand rupees?—This year I got out about Rs. 8,000. If they know that the Deputy Commissioner has a desire that the people should take *takavi* for this purpose, they will take them, because they would like to please him.

125. Q. You say in reply to Question 5 "one embanked field costs twice as much per acre as a number altogether?"—Yes.

126. Q. If you had a certain amount to distribute, I suppose you would take tract by tract and give all your money out in one place to a lot of fields all at once, rather than to distribute it all over the place to anybody who would take money?—That would be the most economical way but the difficulty in practice would be that all these people might not be willing to take it. I would let anybody have it for 2 or 3 years and as the custom gets hold of the people, I would be stiffer in my division and insist upon a lot of people coming together. It is a question of policy.

127. Q. What were people employed upon in the late famine in the Hoshangabad district?—They did mostly public works, but they did a certain number of village works most of which I am afraid were anything but successful from an agricultural point of view.

128. Q. What class of works were they?—Field embankments and tanks.

129. Q. They made field embankments?—Yes, but very badly.

130. Q. In any future programme of works would field embankments occupy a place?—I think I could run the famine relief of the district on field embankments alone easily. I had a village work survey made

agricultural matters which the Revenue Department has.

135. Q. Suppose it was done by the Civil agency, would you employ people on them for famine relief?—I would.

136. Q. Would you give them daily wage or would you do the work through the malguzar and make the payment on the work done?—I would do it on the piece work system. We did all our work on piece work in Bilaspur in the last famine, and it did strike me as very successful.

137. Q. Whom did you pay the money to?—To the malguzar and he gave it out to the people. We had an account book with a page for each man showing what he had been paid. This served as a sort of check, for you might go up to a man at any time and ask him when he had been paid and how much he had been paid and the reply he would give would invariably tally with what was recorded in the note book. There was extremely little cheating.

138. Q. Did you work on that principle in making field embankments?—Yes. We did field embankments in that way.

139. Q. (Mr. Muir-Mackenzie.)—What is the inducement given to the malguzar to take all this trouble?—If you are doing field embankments he would begin by making a little bit in his own land and then in his tenant's land. It is a question of diplomacy between yourself and the malguzar. He tries to get as much as he can and you try to give him as little as possible.

140. Q. You say that you could run your famine labour by means of these embankments. Would you go so far as to get Government to make these embankments if there is no famine?—What I should like to have is this. My own idea of the scheme would be to have an embankment of 5 or 10 acres or whatever the economical area would be and run it in 2 or 3 places by the Government Agricultural Department. It should be made by the Government and managed by them for 2 or 3 years on business basis and we should show our profit and loss account to the malguzars.

141. Q. These embankments are to be made in the black cotton soil area?—Yes.

142. Q. It is quite flat land?—Yes, compared to the surrounding land. It is only a relative term.

143. Q. Is the country generally flat or level or undulating?—There are very extensive tracts of soil which one might call absolutely level.

144. Q. Would you prefer slightly undulating lands?—I would prefer Itarsi lands. You can make embankments anywhere there. I speak from practical experience of the last famines and I have laid out money on this. I have done it on the suggestion of malguzars. What I have learnt I have learnt from them.

145. Q. Embankments for wheat?—Yes. You can embank anywhere, but the only question is whether it is worth it. You have to do so much of cutting.

146. Q. Where did you do embanking for wheat? In Mungeli in Bilaspur.

147. Q. Do they grow wheat now?—Yes. The average area is 50,000 acres.

155. Q. How high did you make the bunds generally?—About three feet. That was the set down.

156. Q. You talked about the giving of agricultural education to people. What do you mean by it—showing some of these things by way of example or do you wish that agricultural education should be extended amongst the people?—Showing things by example. There are not very many things that we can teach. There are definite object lessons that we can show them.

157. Q. Have you got very much kans in Hoshangabad?—A great deal especially all round Itarsi.

158. Q. These embankments have been represented as being of special value for killing kans?—Yes. That is what the malguzars in the district say. They say that the first thing that the bund does is to kill the kans. You cannot kill it unless you can flood the field with water. But there is a cheaper way of killing kans than by means of bunds. If that is the only use of making bunds I would not advocate them.

159. Q. That is not the experience in Bina. They are making bunds with that object chiefly?—I have seen how kans is got out in other ways.

160. Q. They say that is the only method?—If you work out what they say, you will find they are not right. They are not really self-conscious; they do not know well enough what their own thoughts are.

161. Q. You say that you could get rid of a considerable amount of money for the purpose. Have you any difficulty in finding solvent people to take the money?—At present the district is in a bad way. The average solvency of the people is rather low. All those people who took loans produced good sureties.

162. Q. You think you could find more of such people?—Yes. The district will improve in solvency in the next two or three years.

163. Q. Are you recovering what you have already advanced?—I have not had experience in the matter of recovery. These people to whom I have advanced money are those from whom you can recover it all right.

164. Q. I understood you to say that you advocate as a good measure, the postponement of the recovery for a year or two. You postponed it till June 1903. Do you think that is sufficient in the case of these embankments?—Do you mean sufficient to induce them to do it largely or sufficient from an economic point of view.

165. Q. First of all we will take it—sufficient to induce them?—It is sufficient to induce the people that I was dealing with. If I had a man, for instance, whom I could have got to take it, only by extending the period to two or three years, I would be ready to do so.

166. Q. You do not think it is necessary to extend the period to five years?—No.

167. Q. When does the thing begin to pay?—Suppose you put a *Bhandia*, you put your earth and it is made to settle. All your weak points come out in the new rains—where your levels have been wrong and all that. You get half the profit out of it in the first year. Perhaps in the next year you still have to put something right and in the third year you get as much as you can get from it.

168. Q. (The President.)—Can you not put the levels right?—I personally get levels taken occasion-

ally. As a rule, people have a piece of string, hold it across a field and look along it. When they are digging a channel they let the water run and watch how it goes.

169 Q. Once these embankments are made, do you think they will be kept in repair?—O yes. There is very little doubt about it. The repairing of the *Bhandias* is very much more regular than repairing of the tanks. If there should be a hole in it, the man is done for. It is his business to look to the repairing of the *Bhandias*.

170 Q. Would you like to have professional levelers or would you do that yourself?—I could use the levels and teach intelligent *malguzars* how to use them. Mr. Harriott taught me in about half an hour how to do it.

(Mr. Harriott).—The Madras Ghât tracer is a very good thing to work with.

171 Q. (Mr. Muir-Mackenzie).—Do you not find people too much broken to take advances in other districts in Bilaspur, for instance?—In Bilaspur I gave out nearly two lakhs in 1896-97.

172 Q. Can they manage any more?—They could take a certain amount of *takavi* and nothing more unless we use pressure.

173 Q. When people are so broken that they cannot take *takavi* on ordinary terms, how are you going to manage to give more?—We must go on slowly. I would offer them a special inducement for the first three years. I do not know what the Government would do but the utmost I would do is the remission of one-fifth of the principal as in the case of famine loans.

174 Q. You would not postpone recoveries altogether?—It would probably do well to do that.

175 Q. Would you be in favour of recovering only the interest until the man should find himself in a position to repay his capital?—They are not afraid so much of having to pay out of the work which has not succeeded. The success of the work is not a thing which helps them to pay the money. They have got all the rent of the land from which they could pay it. But what they are afraid of it is they would have a bad year.

176 Q. I am not driving at that. I am thinking more of the bankrupt state of the people. In consideration of that fact, would it be a good thing for Government to invest money on these things and allow the people to pay no more than the interest till they entirely recover themselves, till it is perfectly convenient for them to pay—it may be perhaps never?—I think if you are careful to select the right sort of men it would be a very good thing. I should scarcely like to say anything definite without trying it on the people.

177 Q. But you would be glad to try an experiment?—Certainly, I would be glad to try it as an experiment.

178 Q. Do streams hold water now in Hoshangabad?—Yes.

179 Q. Larger ones?—There are lots of small streams which hold water very much better than bigger streams.

180 Q. Are they holding this year?—Yes.

181 Q. Are they very deep?—Yes. Between Piparia and that *tar bridge*, there are several streams which you cross, which have quite low banks and which hold a certain amount of water in them and which have a good deal more underneath the sand.

182 Q. What is the soil?—On the banks there is a good deal of *sehar*. And as you get further away the soil gets blacker and blacker.

183 Q. They would be favourable places to try *tars*?—Yes.

184 Q. With regard to the *malguzar's* management of tanks, do tenants get less than the share of water they are entitled to?—Tenants are not entitled to anything legally speaking. If a *malguzar* cuts the tank, he gets as much as he ever wants for his own fields.

185 Q. That is the recognised custom?—Yes. If there is anything left others get it.

186 Q. If that is the recognised custom, how can you well change it? What authority have you to do it?—I think I would undertake to change it.

187 Q. Unless you give the man compensation, it seems difficult to see how you could encroach upon his private property?—If you did it by legislation or by alterations in the terms of *Wajib-ul-arz*, you must have a compensation clause. But I fancy that a little diplomacy would probably set things right. Local influence goes a great way with that sort of people.

188 Q. Is there considerable area under tanks in

Bilaspur irrigated by percolation?—Not as much as is entered in the records.

189 Q. You mean settlement records?—Yes.

190 Q. It is not entered in the annual records as a rule?—Yes. It is a little bit overstated in the settlement records.

191 Q. The annual records considerably understate the area irrigated by percolation?—Yes. They omit irrigation by overflow, they omit all incidental irrigation.

192 Q. And the irrigation that is obtained by cutting bunds?—Yes.

193 Q. Do you think that the efficiency of tanks would be increased by a general provision of sluices?—Yes, very much.

194 Q. Are the tanks capable of being improved so as to increase the supply—I mean the existing tanks?—Yes. A good deal was done in the famine in that direction and we could still do a good deal more.

195 Q. There were a great many temporary wells that were used. Was the number of temporary wells at all increased in the famine year? You only refer to Mr. Sly's statistics?—Yes.

196 Q. I don't think there was much of an increase. If there was an increase it was very slight. He seemed to think that these statistics were not altogether to be depended upon?—You cannot say they are understated. A man does not irrigate his wheat simply because it is a famine year. The irrigating of wheat and the ordinary cultivation of wheat are totally different things in this country and if you are going to irrigate wheat it is done in certain places only. Wheat would not be shown at all to be irrigated. So the famine year would not probably show an increase in the irrigation of wheat. It would increase the irrigation for a term of years and it would not increase the irrigation of wheat only in that particular year.

197 Q. Probably they did not do it in Hoshangabad. What they did in Bombay was to dig wells, to get irrigated crops?—They did not do it here.

198 (Mr. Muir-Mackenzie).—If a person had a well and had water in it, his neighbour would dig another to grow a fodder crop and also a grain crop to save himself and his cattle. That was not done at all here?—No. In black soil the mortality of cattle during the famine was not very big. In Bilaspur in black soil parts, the cattle were in as good a condition as they had been in any other year.

199 Q. In Hoshangabad?—I was not there then.

200 Q. How deep are these temporary wells?—The shallowest is about 5 *hots* or 7½ feet and the deepest temporary well I have seen is 15 *hots* or 22½ feet.

201 Q. Why don't they convert temporary wells into *pukka* wells?—Many of the people are now beginning to do it and have taken *takavi* for the purpose. I have had from villages about 30 or 40 applications.

202 Q. Do you think that might be usefully extended?—Yes, very usefully extended.

203 Q. Would it be easy to map out the tracts in which wells could be profitably dug?—I should think I can do it in ten.

204 Q. Do you think that if you had, at the beginning of a famine, a tolerable sum of money placed at your disposal with the suggestion that you should induce people to grow irrigated crops—do you think you can induce them to do it?—It does not want money to make temporary wells, but all that is needed is that they should be persuaded to do it.

205 Q. Temporary wells cost so little that we have to advance such little sums as Rs. 5 and 10. They want money for the *môt*?—Yes, they do. The land in which you can make temporary wells is held by poorer classes of people.

206 Q. Do you think you could have done anything in this way, supposing money were wanted?—I am inclined to think not. But I would not like to say anything definitely. I would do everything, other than giving the money, to do it. I should talk to them about it, persuade them to do it. I should give them *takavi* for seed grains on the condition that they sowed irrigated wheat crop.

207 Q. At any rate you would endeavour to push the making of *kachcha* wells at an early stage of the famine?—Certainly.

208 Q. About the famine programme, I gather from what you say that you would like to see it largely consist of village works?—Yes.

209 Q. And almost entirely of this kind of work a sort of subsidiary form of irrigation work?—Yes, according to the type of work suitable to the district. In certain districts you cannot do very much.

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210. Q. Which districts?—I do not think you can do much in jwar and cotton districts.

211. Q. (Mr. Rajaratna Mudaliar).—You said in reply to Mr. Muir-Mackenzie that there was a recognised custom for malguzar to take all the available water for his own fields before giving it to his tenants?—Yes, in tanks which are the property of the malguzar, as most of the tanks are.

212. Q. That is the recognised custom?—Yes.

213. Q. Under such circumstances on what grounds would you interfere to restrict his rights?—You mean in the way of legal interference?

214. Q. Legal or moral interference or diplomacy as you put it—on what grounds would you interfere? As the owner of the tank he is entitled to irrigate his own land?—In the first place his title to the tank is very doubtful.

215. Q. That is a very different question. We have recognised the title so far?—It has never been gone into. The question has never been raised.

216. Q. In cases where he is the registered owner of the tanks, on what grounds would you interfere with his rights?—I cannot be justified on any other ground than that of expediency, of course. It would be a good thing in the long run because his tenants would habitually irrigate and would be a stronger body and pay his rents more regularly. One cannot justify it on any other ground than that.

217. Q. Is not the fact of the tank-supply being precarious taken into account at settlements?—Yes. Our irrigated factors by which we determine the value of the irrigated land as compared with that of the unirrigated land are extremely low.

218. Q. Practically the precarious nature of the supply to the lands held by the tenants is taken into account in fixing such a low assessment?—Yes.

219. Q. Under such conditions the malguzar has every right to appropriate as much water to his own fields as may be required before he can help his tenants?

(Mr. Muir-Mackenzie).—Mr. Low, admitted that a compensation clause will have to be inserted.

(Witness).—If I tell a malguzar that it is hard on the tenants if he does not give them water and also tell him "Why don't you be kind to them? Let them have some water", he would probably yield, if he is a decent sort of fellow. But apart from that, if you are to propose empowering the Government to do that, you would certainly need some compensation clause.

220. Q. (Mr. Rajaratna Mudaliar).—In reply to Mr. Higham you said that several field embankments were made in the famine?—Yes.

221. Q. Were not the owners of the lands left to supervise the work?—I do not think so. I think it was usually done more or less by Government officers without sufficient reference to malguzars, personally speaking in Bilaspur. I went invariably to the local people and did what they said, unless I found they had improper motives relating to a proposal which very often they had. There is a small embankment made at Mutkuli in the famine. People showed how to do it and it is very successful.

222. Q. If the thing had been left to the tenants themselves they would have employed famine labour?—The tenants' part in it consisted in showing where the site was and how the work should be carried out.

223. Q. What amount was spent in the famine in embanking fields?—I do not know at all for this district. I was not here.

224. Q. In the district in which you served as famine officer?—I could not say. I suppose that in 1896-97, I must have given out something like forty or fifty thousand rupees which were employed on embankments. That is a very rough guess.

225. Q. In regard to private tanks, new tanks, you said that you would prefer to encourage tenants rather than malguzars to construct them?—Yes, because the tenants need more encouragement than the malguzars.

226. Q. Do you think it possible for them to combine together to construct such works?—I think it could be done if you once overcame the initial difficulty. If you get the custom started in a few villages then the rest would follow. But it would not be an easy thing.

227. Q. But if one man obstructs and refuses to give a portion of his land, the whole thing would fail. That is the difficulty?—Yes. If you like to take time over it you can very often induce them to change the fields.

228. Q. In regard to the *muafi* grant that you advocated do you think that a grant of that nature limited

to a term of settlement would be a sufficient inducement?—I do not propose to limit it to a term of a settlement, I will give it for at least two generations. I would prefer to give it for ever.

229. Q. I suppose you would attach a condition that the tenure would last as long as the work is maintained in other?—That would be necessary. That is one of the conditions of the *tukum*.

230. Q. You said that the uncertainty of finding water at a reasonable depth very often deterred ryots from taking loans for sinking wells. In such cases would you think it would be advisable for Government to construct wells leaving it to ryots to buy them at their convenience?—That difficulty has not arisen in this district, because the places where the wells have been made are certain well-defined tracts in which the well is almost certain to be a success. In other parts in which well-sinking had been hardly tried, in the black soil which lies further from the rivers, if it is thought advisable to push well-sinking in those tracts, certainly the Government ought to step in in some such way as you suggest or give them professional well-sinkers.

231. Q. In cases where the burrowers fail to find water would you recommend that a portion of the loan be remitted?—If it is proved that the man did, as far as he can reasonably be expected to do and yet the well failed, I would remit the whole.

232. Q. It was said that the remission of the whole amount would lead to gambling on the part of the ryots by sinking wells in different places by getting loans and that it would be difficult to check whether they did all that they could do?—That would be in the discretion of the officers who give the plan. At present one should satisfy oneself that the work would be advisable. I would not give out a loan unless there is a reasonable chance of the work being a success.

233. Q. Could you recommend the grant of loans to malguzars and hold them responsible for the proper distribution of money to tenants and for their recovery in easy instalments?—I do not know if the malguzars of our district would do it at present. They are too hard hit in most cases.

234. Q. I suggest it simply to avoid the delay in disbursing loans incidental to the enquiry that you will have to make.

235. Q. (Mr. Muir-Mackenzie).—Mr. Rajaratna Mudaliar's suggestion is that you should put the malguzars in possession of funds to disburse the loans?—This is only a temporary feature of the district. It is rather hard for me to say what should be done if the district is in normal condition. Some malguzars would do it but they would only be very few.

236. Q. (Mr. Rajaratna Mudaliar).—Wherever you can find malguzars who would do it, would you distribute the money through that agency?—Yes. As that malguzars said yesterday, it is a thing that we will have to look after very carefully because there will be a great deal of malpractice. It could not be done without Government supervision of the transaction between himself and his tenants.

237. Q. That is necessary. Otherwise these people may misappropriate some portion of the amount?—Yes.

238. Q. In Hoshangabad district in the first five years of the decade the total area of cultivation averaged over 1,050,000 acres, but in the next half of the decade it averaged only about 840,000 acres or so?—That is partly owing to bad seasons and partly owing to a large area going to Khandwa district.

239. Q. There are large variations in the irrigated area in Bilaspur. In one year it went to 76,000 but in some other years it was 34,000. Do you think that the figures can be accepted as correct?—I should say that the proportion is probably correct. I do not think that our record of irrigation is accurately kept. These results represent the gross facts. For instance, in the year after the famine I was in the district for a month just before I came here. I carefully saw the number of tanks under which there was irrigation, because the tanks were made under my supervision before. But I did not find a single case of irrigation under them on account of heavy rainfall before.

240. Q. (Mr. Muir-Mackenzie).—Was there any *pujra*?—No *pujra*, no cutting of tanks.

241. Q. (Mr. Craddock).—Do you think that anything could be done to the Sohagpur tahsil?—That is a much more promising field for irrigation than the rest of the district.

242. Q. You think it possible that with a large work there, people might take to irrigation, the soil being much lighter?—There are several large areas

which, if supplied with water from a large work, would take water. With a lead from Government they would introduce improved methods of agriculture in response to improved water-supply.

243. Q. Would you like the Government to make an experiment in that particular tahsil rather than in any other part of the district?—Yes. I would sooner make the experiment in Sohagpur than in any other part. One thing is that there is greater scope for irrigation there than elsewhere. The other thing is that part has the worst soil in the district.

244. Q. There is light sandy soil mixed up with wheat land?—Yes, just like the *Dudy Group*.

245. Q. Do you think they would grow rice as well. They have a lot of rice in Narsinghpur?—There is a good deal of rice in Dudy, but the only thing is it is of inferior quality. I should like to induce them either to grow a high class rice or to grow early rice and then wheat after it.

246. Q. As regards village tanks you said that you would like them to be left as much as possible to the people themselves and you would not want the Government to make a tank when it is to benefit only a single village?—Yes.

247. Q. You would say the same thing with regard to tanks which might be very much improved?—Yes.

248. Q. Do you think it would be a bad thing for Government to give grants-in-aid towards the maintenance of tanks. You see that the maintenance of irrigation works in a village is beneficial to Government revenue?—Yes.

249. Q. In consideration of that do you think that grants-in-aid could be given in cases where a village is unable to undergo the cost of the whole of the repairs?—In cases in which the tank is far gone, I should be inclined to give that aid. But I should not be inclined to do it for the regular upkeep of the tanks. Where a tank is far gone, as is the case with regard to several tanks in Bilaspur, I would have some money given for the tank to be dug out—I mean where a tank has silted up. That was a very common form of famine relief.

250. Q. (*The President*.)—Is it not very expensive to dig out a tank?—If you want to do it on an economical scale, you can dig the tank for 200 or 300 rupees so as to make it a great deal better. You will have to dig out 2 or 3 layers.

251. Q. I should think it would be cheaper to make a new tank than to dig out an old tank?—You may dig the tank and put the earth on the bund; and by so doing you get double the amount of water that the tank held before. I also induced the people in Mungeli to take the silt out of the bed and to spread it over their fields.

252. Q. (*Mr. Craddock*.)—I was alluding more to those tanks which no longer held water because the bunds burst and which have never been repaired by the local malguzars and which the people are not able to put in repair. Do you think that it would be a good thing for the Government to give some aid if the malguzar and the people would pay what they could towards the repair of such tanks?—Yes, if it is insured that the money would be properly spent.

253. Q. Do you think that we should then be able to arrange for irrigation afterwards from the tanks?—It would put the Government in a position to ask the malguzars to give better terms to their tenants in the matter of irrigation.

254. Q. Do you think that malguzars would prefer to have the tanks repaired in this manner?—Most of them would prefer it.

255. Q. Do you think you could give similar grants in Hoshangabad?—Yes, certainly I could.

256. Q. As regards the bunding up or the damming of streams, would you propose to give any help?—I do not know much about the damming of streams, but I would certainly make a few sample field embankments in fields of selected tenants or malguzars. I would not do them in the poorest men's fields, because they would not put them to the best use. I would make them in the land of the person who would make the best use of them.

257. Q. How would you get any return to Government for this?—I would look for an increased income at the coming settlement.

258. Q. Would you then get an enhanced rent?—Yes.

259. Q. Do you think you would get an increase in proportion to the money spent?—Suppose it costs Rs. 30 an acre—that is only a rough guess—to make a field embankment and suppose the occupancy tenant was paying Rs. 1-8-0 an acre, you could very easily make him pay Rs. 2. If you gave him a really good and

successful embankment I do not think he would grudge to pay even Rs. 2-8-0.

260. Q. (*Mr. Muir-Mackenzie*.)—That will only be 3 per cent.?—Yes. With regard to works constructed by malguzars I have never seen any work which would pay 8 per cent. in cash if the value of the work is capitalised. I do not think you should judge of the matter in that way. There are lots of malguzars who would get a better return if they lent the money on interest. This is purely a question of sentiment—the malguzars think that by the construction of irrigation works their own stability is increased.

261. Q. (*Mr. Craddock*.)—To go back once more to Bilaspur. Suppose you are able to make large tanks and give the tenants good irrigation, what do you think the people would pay for it, how much an acre?—It is not easy to say it with reference to Bilaspur, because at present the conventional rent holds the field so very strongly—and the Government has emphasized that by its policy of rental fixation—that I think the estimate of one rupee which I have given is pretty fair.

262. Q. Would you recommend water being given to them free for two or three years so as to enable them to appreciate its advantages and then their being asked to pay for it?—Yes. I do not think you could straight away put a fee on water. The thing requires a certain amount of careful handling for the first two or three years when we should give them water either free or on some concessions.

263. Q. If you put on a rate to begin with, it is likely that only a very few people would take water and therefore the advantages resulting from the use of water would be restricted to those very few cases. whereas if you gave it free you will get many more people to take it and therefore many more people would be able to appreciate its advantages and would be willing to pay a rate later on. Do you think that with your knowledge of the people of Bilaspur you would advocate water being given free for the first two or three years?—You would require some extra inducement in some form or another being given for the first two or three years. Free water would be the best form of inducement in my opinion.

264. Q. If you fill the village tanks how will you arrange about payment for the water supplied?—There is one great difficulty in regard to filling village tanks. If you fill these tanks, you assume that they will irrigate from the tanks. In Mungeli they are at present very loath to do it, principally for reasons arising from a state of things which have existed during the last 30 years. I think it will be much easier to begin by giving water direct from a Government work than to give it through village tanks, though the latter might be done later on. It is better to start the selling of water from your work direct.

265. Q. Do you think there would be any difficulty in having the payments distributed among his tenants by the malguzar—payment for water taken from the tank by the tenants?—Probably they will prefer the Government to distribute it.

266. Q. That would be a troublesome business?—No. Why should it be so?

267. Q. I do not see how you could arrange the establishment?—You would assume the average irrigable area and from that you can fix the lump sum and make it payable by the malguzar every year. You may either fix a proportionate factor for each field or allow the malguzar to get the water and to distribute it on these lands according to that.

268. Q. The difficulty about it is the question of excess water. In many of the tanks, water already fills them and they might want to fill them only when there is not enough water?—You can very easily calculate the excess area which will be irrigated.

269. Q. It is not only the question of excess area, but also the fact that some of the fields which usually got water would get extra water which they would not get but for the Government supply. It is somewhat difficult for a Government officer to apportion what each man should pay for this extra water?—You would decide once for all that such and such a field should have such and such a factor in the distribution of water. The malguzar is quite capable of apportioning the rate of rent among the people.

270. Q. The malguzars could no doubt do it, but it is very difficult to supervise what he does, inasmuch as the rate may vary from year to year?—If you make them pay for what they actually take, it would obviate all difficulty. Would you make them pay on what they could take or on what they should take?

271. Q. (*The President*.)—My idea is that if a person wants to take water he must pay a round sum to

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Government?—If I may venture to point out, I may say there is one grave objection to that course being adopted. That is you would drive them away from the way of taking the water in famine years; whereas if you gave them the option to take as much as they require for smaller areas in average years, you would induce them to take water.

272. Q. In the other case it will be a matter of contract between the owner of the tank and the Government?—You say that if he will take water for a year he will have to pay so much rate and that would incline people to take water for the year and to introduce a higher sort of cultivation.

273. Q. (Mr. Craddock.)—The difficulty lies in the case of tanks which are already fairly good and irrigate a considerable area. The feeling of malguzars is: "if we have got to pay for water when we have already made a tank it is very hard; what we do not mind is paying something for the excess water that we take in years when our tanks do not hold a sufficient supply, which will very rarely be the case?"—I should leave it to the malguzars to take it whenever they like or to take it for a term of years.

274. Q. (The President.)—There is another way in which you can look at the matter. To induce malguzars to go in for second crop, I would say "we will not give you water till the 1st of December when you can take it for a second crop?" In that case they would grow a better sort of double crop than they do at present. Double cropping in black and brown soil is very common.

275. Q. Would they do it on black soil?—No. In yellow soil you could grow second crop with irrigation.

276. Q. Could you not grow a second crop without with it?—You cannot grow a second crop on *mattasi*.

277. Q. They seem to feel doubtful about it?—I have seen second crop on *mattasi* and *dorsi* fields on which water stood.

278. Q. (Mr. Muir-Mackenzie.)—When you improved your tanks in famine did you not occasionally increase the water spread?—Yes.

279. Q. Did you not cover up the occupied land?—Yes.

280. Q. How did you manage that? Did you give compensation?—No. We usually got the malguzars to give the owner of the land which we take up, another bit of land in return. The malguzar was tremendously benefited by tank and he was usually quite willing to give another bit of land.

281. Q. Was generally land available?—The malguzar would usually give a bit of his own land. We settle these things before we commence the work.

282. Q. What is the nature of the provisions of legislation that you would introduce in order to make the people amalgamate their holdings. Can you give me a rough idea?—You will have to bring in the question of exchanges.

283. Q. Would you ask the Settlement officer to do it?—The Settlement officer is not always with us. I think I would begin by empowering the Assistant Commissioners and then we might go as far low down as Tahsildars if you find the thing a success. Suppose a man had a good and sufficient reason for wanting to change a field, you will have to see whether he wants the change for making a work or because his fields are very scattered. If he offered to exchange his field with another man, I would make it compulsory that the man who wanted to exchange should give 15 per cent. of the value of the land extra either in field or in cash. I think it would be better to stick to cash because it is rather hard to decide about the value of the field so nicely. I should have a panchayat of five villagers to assist in the matter and would make the exchange compulsory unless the man could show a good cause to the contrary, provided the man who wanted the exchange would pay down 15 per cent. extra on the value of the land.

284. Q. That is to see that the other man is not unduly injured?—Yes. If a man who did not want the exchange could show that a better exchange could be made with the field of somebody else, that would be a valid defence. Then the third man could be proceeded against instead of the second man.

285. Q. Now for your embankments, is there any fear of your not being able to take up land for embankments? Suppose you have to enter upon the field of other people and to build embankments, can you do it or have you got any fear of the people objecting to it?—I do not think that anybody would object. If I like to go into any village in my district and tell the people that I want to make embankments on 400 acres, I think they would jump at the idea.

286. Q. Do you think that there is any room for the extension of wells in Bilaspur?—No. They are very limited in extent; they are only just along the edges of streams.

287. Q. Is it because that the water level is very low?—Yes. In the greater part of the district, you have to go through rock.

288. Q. It is not because the people are not habituated to work with wells?—As fast as the Government make drinking wells, they fill them up.

289. Q. Then you do not think it is worth while building wells?—I do not think it is worth while to do it.

290. Q. You are confident that the extension of embankments will not result in an increase of rust on wheat?—I think it makes the wheat more liable to rust, but I think the damage is much less than the profit so that the system of embanking would pay on the whole. The Jubbulpore *haveli* is much more secure than the Hoshangabad district for a term of years. The revenue history of the two districts shows it.

291. Q. Do you think people would be ready to take advances to make embankments and to give in return an increase of rent? Would you secure the whole of that increase to Government or would you give a part of it to malguzars?—In cases like that, I would not give more than a commission to the malguzar for the collection he makes.

292. Q. Do you think people would take money on these terms?—Yes.

293. Q. Mr. Rajaratna Mudaliar asked you whether money could be given to malguzars to be advanced to tenants. I want to put the suggestion the other way. Are there any wealthy malguzars who would be inclined to lodge money with Government for Government to advance it to tenants?—Not in Hoshangabad.

294. Q. Anywhere that you know of?—Nowhere that I know of.

295. Q. I am not speaking from pure imagination. People corresponding to malguzars have come to us in Bombay and said "We have not got a summary process of recovering the money that we advance to our tenants. We can only advance it to them at ruinous rates of interest. The Government will not give us the summary power of recovering the amount advanced. Why should not Government take charge of our money and advance it to men whom we approve?"—I suppose these are *inamdars*.

296. Q. Yes, precisely?—They are often enlightened.

297. Q. Not generally. Of course the man who came to me was enlightened?—Our malguzars who have a lot of money usually lend it at 24 per cent. interest. Our malguzars are in a much stronger position than any other person. If a malguzar in Bilaspur cannot realise his money from his tenants, there is no other earthly power that can do it.

298. Q. At any rate you don't think that there will be any chance of that being done?—No. The malguzar is in too strong a position here.

SIXTY-SECOND DAY.

Pachmarhi, 20th March 1902.

WITNESS No. 42.—MR. F. A. T. PHILLIPS, I.C.S., Commissioner, Nerbudda Division, to Questions drawn up by the Irrigation Commission.

A.—GENERAL.

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1. Q. The answers below refer to the Nerbudda Division which comprises five districts—(i) Nimar, (ii) Hoshangabad, (iii) Narsinghpur, (iv) Chhindwara, (v) Betul. I have been in charge of the division continuously since 26th June 1899.

2. Q. I may say, speaking generally, that in none of the five districts is there any obstacle to the extension of irrigation arising from (a) sparsity of population, (b) insufficient supply of cattle suited to the cultivation of irrigated land, (c) fear of enhanced rent or revenue assessment, (d) uncertainty of tenure

or defects of the Tenancy Law. But the supply of manure is, as a rule, insufficient. A considerable quantity of manure is wasted, the waste being for the most part due to a want of knowledge on the part of the people of the proper use of manure, and this absence of knowledge being the result of custom and tradition which are difficult to break through. However, in any case, it seems probable that the supply of manure would be insufficient. Again, some soils are unsuitable for irrigation, for instance black cotton soil. This is indeed irrigated sometimes for the cultivation of wheat and of sugarcane with success. But the possibility of irrigating it successfully is hedged round with limitations. Further, the supply of water in wells—and practically well irrigation is the only form of irrigation in my division—is dependent on the rainfall, which is sometimes far too scanty, as the experience of recent years has shown. The main obstacle, however, to the extension of irrigation is to be found in the lack of capital for initial expenditure and of funds for the more expensive cultivation of irrigated crops. The construction of a well is beyond the means of the majority of the tenants and the cultivation of (say) sugarcane is too costly for most of them.

3. Q. I am of opinion that the rules now in force with respect to the exemption of land, irrigated from works constructed with private capital, from enhancement of assessment on account of the irrigation are sufficiently liberal. At the same time there is reason to believe that many agriculturists are ignorant of the rules.

4. Q. Loans under the Land Improvement Act are certainly not taken freely for the extension of irrigation. I think that the unwillingness on the part of the people to take such loans is probably due more to custom than to anything else. It seems to me that this unwillingness can only be gradually overcome by persuasive instruction and the exertion of influence by Revenue Officers. I would not recommend reduction of the rate of interest or remission of the interest or partial remission of the advance or grants-in-aid save under very exceptional circumstances, as, for instance, in time of famine. I think that these measures would ordinarily be demoralizing. I would, however, grant total remission in case of failure of the attempt to obtain water, if the attempt were satisfactorily shown to be genuine, and made in a reasonable manner. I would also extend the period of repayment in individual cases for good cause shown. But if the period originally fixed were suitable, as it always should be, the necessity for extending it subsequently would seldom arise.

6. Q. It cannot be said that there is any irrigated tract in my division. Irrigated land is to be found only in small isolated patches here and there. Consequently there is no fear of the attraction of cultivators from unirrigated to irrigated tracts to the detriment of the cultivation in the former. I cannot say that I have noticed any strong desire among the people in any part of my division to have means of irrigation extended to that part. But I think that in parts of the Nimar district, the value of the irrigation

is now much more thoroughly appreciated than it was a short time ago.

E.—WELLS.

34. Q. (1) I believe that the average depth of wells in the valley districts—Nimar, Hoshangabad and Narsinghpur—ranges from about 70 to 120 feet, and in the plateau districts—Chhindwara and Betul—from about 100 to 150.

(2) The supply of water is usually obtained from percolation. It never becomes too saline and it does not fail in an ordinary year, though it is apt to fail in a year of drought except in well sunk in low-lying land near streams and rivers.

(3) The average cost of a *kachcha-pakka* well is about Rs. 150 or Rs. 200. It is believed to be rather more in Nimar, where the wages of labour are higher and the soil is harder. A completely *pakka* well costs considerably more say, 2½ times as much as a *kachcha-pakka* one on the average.

(4) A *kachcha-pakka* well should last from 12 to 15 years.

(5) Water is usually raised from wells by means of a pair of bullocks and a leather *môt*. In some places the Persian wheel is used. I have seen it here and there, both in the Nimar and the Narsinghpur districts. At Rampura in the Gadawara tahsil of the latter district, one Girdharilal Kirar (who is now dead) used an ingenious contrivance of two wheels and two *môts*—invented, I believe, by himself—whereby one *môt* ascended while the other descended. Thus, with the same bullock power, he drew just twice the quantity of water that is drawn in the ordinary way.

(6) The average area attached to and commanded by a well is believed to be about 7 or 8 acres. I am informed that in the Betul district one well serves two acres of sugarcane and garden crops and 7 acres of wheat, gram, etc. I do not think that the area served by a well is different in the other districts.

38. Q. Serious difficulties are occasionally encountered in the selection of a spot for a well in which a supply of water will be obtained. Such difficulties were encountered in certain places in the Betul district in the famine of 1900. But, speaking generally, I may say that the location of a well in any part of this division is a comparatively easy matter. As far as I know assistance has never been offered by Government or by local bodies in the shape of expert advice, trial borings, the use of boring tools, or in any way. I doubt whether such assistance is called for.

39. Q. I am not in favour of the construction by Government of wells in land which is private property. It would be impossible to construct wells for everybody and it would be invidious to construct them for some persons but not for others, unless some definite rules were laid down as to the persons for whom they might unobjectionably be constructed. Even so, proper discrimination with respect to these persons would be almost impossible. Further, such action on the part of Government would tend to weaken the sense of self-reliance.

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1. Q. (The President.)—Mr. Phillips, you have been nearly three years as the Commissioner of this Division?—Yes

2. Q. And you have a fairly extensive knowledge of the other divisions of the Central Provinces?—I have been in 10 districts altogether.

3. Q. You say in reply to Question 2, "some soils are unsuitable for irrigation, for instance black cotton soil. This is indeed irrigated sometimes for the cultivation of wheat and of sugarcane with success. But the possibility of irrigating it successfully is hedged round with limitations." What are these limitations exactly?—I meant rather to imply that there are really very few places where, according to one's information, irrigation on black soil has been successful.

4. Q. I suppose that there are considerable differences in the kind of black soil. It is not all of one kind?—Yes, there are many varieties.

5. Q. You say "this is indeed irrigated sometimes for the cultivation of wheat and of sugarcane with success." Is that in Betul?—Yes.

6. Q. You say, "the supply of water in wells—and practically well irrigation is the only form of irrigation in my division—is dependent on the rainfall which is sometimes far too scanty." Did wells fail seriously in the time of drought?—Yes, seriously in parts of the division, namely, in parts of Betul and Nimar.

7. Q. Nimar is dependent altogether upon its wells for irrigation?—Entirely.

8. Q. Do you know whether any effort was made at that time to deepen wells?—Yes.

9. Q. With success?—Yes, with a great deal of success. A great deal was done in Nimar—more than in any other district in the division—during the famine in the matter of wells.

10. Q. It meant, I suppose, the jumping of holes in the rock?—Yes, in some places: more often they deepened existing wells.

11. Q. Have you much of bunded fields in your division?—A great deal. In one district, Narsinghpur, there is a great deal of embanked land.

12. Q. Why does the system not extend further to other parts?—I think it is merely on account of custom that it has not spread further west into Hoshangabad. The Dudhi river divides Hoshangabad from Narsinghpur, and on either bank there is a stretch of sandy soil which is unsuitable for embankment. Embanked fields are not therefore met with in the Gadawara tahsil of Narsinghpur for several miles east of the Dudhi river. Consequently the people of Hoshangabad, who live to the west of the sandy stretch on the west bank where there are soils similar to the soil in the centre of Narsinghpur, have not got before their eyes the example of bunded fields and therefore they have not taken to them.

13. Q. Do you think it is a gospel that ought to be preached to the people elsewhere?—I think that the note of warning which Mr. Sly has sounded should be kept in mind. It may be that embankments are not

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to be found in Hoshangabad because the soil is not there. There is the other theory, to which he has alluded, that the difference in the soil is the effect and not the cause. Of course I am merely a layman in regard to these matters. But it seems to me that Hoshangabad is just as well suited as Narsinghpur for embankments. A beginning is now being made in Sohagpur tahsil, in the eastern portion, in inducing people to try embankments.

14. Q. Are loans given to them for the purpose?—Yes. During the last two months the Deputy Commissioner has succeeded in giving out a good deal of money in loans for embankments, and after the next rains we shall be able to see what the result is.

15. Q. You say in reply to Question 4, "loans under the Land Improvement Act are certainly not taken freely for the extension of irrigation. I think that the unwillingness on the part of the people to take such loans is probably due more to custom than to anything else." We have all remarked—my colleagues and myself—how little is done in the Central Provinces in the way of giving out loans as compared with what is done in other parts of India. Don't you think it is to be regretted?—Yes.

16. Q. Have the seasons of drought induced people to take more loans?—No. They have had the unfortunate effect of depriving them of any means that they might have had of taking such loans. The loans that have been given of late have been only for seed and cattle. These are extensively taken; but it is only of comparatively recent years that even these have been extensively taken. I remember the time, 15 years ago, when hardly any loans of any kind were ever given. Then came the time when the Deputy Commissioners pushed the loans and they succeeded in a measure in getting the people to take them, at any rate, for seed and cattle. Then came a series of bad years when the land improvement loans were lost sight of altogether. People began to take loans for other purposes and the land improvement loans were not pushed.

17. Q. (Mr. Muir-Mackenzie).—Still a large amount of *takavi* was advanced for land improvement. Was it not so?—In 1897, what they called famine loans—which were really most unpopular in most parts—were pressed everywhere upon the people at a time when they did not want to take them.

18. Q. You mean the method of giving famine loans as famine relief?—Yes. It did not appeal to them at all. There was a good deal of semi-compulsion.

19. Q. (The President).—You say in reply to the same Question No. 4, "I would also extend the period of repayment in individual cases for good cause shown." Up to what time would you extend the period?—I do not know if I would extend it to the maximum period allowed. In practice the maximum period is not given. If a loan is made repayable in ten years I would, if there is any special cause, subsequently extend the period to 15 years. I would not extend the period to 35 years.

20. Q. But would you extend the customary period?—Yes.

21. Q. How is it that the customary period is so much shorter than the legal period. Is it on account of over-zeal of native subordinates who are too anxious to get the money back quickly?—No; but there is a general indication on the part of the Administration that nothing like the maximum period should be given. For instance, the Deputy Commissioner must not give a longer period than 15 years without the sanction of the Commissioner.

22. Q. (The President).—Has his sanction to be obtained for giving 15 years?—No. If you want to give more than 15 years, then the sanction of the Commissioner is necessary. But the ordinary period given by the Deputy Commissioner is 10 years.

23. Q. You say that you would not recommend a reduction of the rate of interest or remission of the interest. Would you approve that repayment should not commence until the work is completed. Suppose a man takes a loan for a well; it would be a couple of years before the well is made. Would you require that he should not be asked to commence to repay the amount till he has seen some fruits of his work?—I think I would; that would be fair.

24. Q. Do you think that it is judicious to put into the hands of the Deputy Commissioners the power to postpone repayments if the man could really show that he had a season of bad luck?—Yes; the Deputy Commissioners might safely be trusted to exercise the discretion properly.

25. Q. We have had it in evidence again and again that the reluctance of the people to take loans is partly due to the inelasticity of the repayment rule and

rigour with which the repayment is exacted by a certain date?—I am not myself quite certain that there is really much in that. I think that feeling could soon be got over by little reasoning and persuasion.

26. Q. With the object of extending such irrigation works as are possible, whether they be embanked fields, tanks or wells, and of affording protection against famine, would you recommend that these loans should be specially brought to the attention of the people and that they should be made as popular as possible?—I think that this is the policy that should be followed just now.

27. Q. Have the Deputy Commissioners time enough to attend to this or are they too busy?—I think they have time. They can make time.

28. Q. We have had the proposal made to us that particular officers should be told off to do nothing else but arrange for loans throughout the district. Do you think it would be worth while to take such a step as that?—I think it might be good in some places, but it would probably be necessary to do it for a short time only. I think there is a danger of pressing that kind of thing too far.

29. Q. I am rather surprised at what you say in reply to Question 34, that the average depths of wells in the valley districts of Nimar, Hoshangabad and Narsinghpur range from 70 to 120 feet?—These figures were supplied to me very hurriedly, and I am afraid they overstate the facts. I may remark that they refer to wells of all kinds. In one of his reports the Settlement Officer of Nimar says that water is reached at a depth of 25 feet. That is in that particular part where irrigation wells are sunk. I rather refer to wells generally. If you take the whole district it would be very much more than 25 feet before you reach water.

30. Q. Up to what depth would it be profitable to irrigate—up to 70 feet?—I think so.

31. Q. It is a tremendous depth?—Yes, it is. They do certainly use very deep wells. Of course it involves more bullock power.

32. Q. (Mr. Higham).—They are only used for garden crops and cane?—Yes. For sugarcane; some of the wells are quite deep.

33. Q. (The President).—Are they used for wheat irrigation?—Yes, but to a less extent. Probably a deep well would not be used for wheat irrigation. The ordinary practice in Betul and Ohhindwara is to have these wells for sugarcane, and if they can spare any water after giving it to sugarcane, it is then supplied to wheat beyond the sugarcane. Probably deep wells would not be used for wheat.

34. Q. Do you think it would be a popular measure and a sensible one to attach to every district a trained well-borer who might go about and help the people in the construction of wells. Apparently the ordinary peasant in looking for water goes a good deal by guess work?—Yes. I think the system might be tried; but it is very difficult to say how far it will be popular. Because it is always difficult beforehand to state how far a novelty of this kind will go down with the people.

35. Q. What do you look upon as a suitable line of defence as against famine in your division? Do you think that wells can be multiplied in Nimar practically to any extent?—I am told they cannot be multiplied. I think there are parts of the Nimar district where they would be of very little use.

36. Q. A large extension of tanks is possible?—I think not in the Nerbudda division. There are places where tanks can be made. But I do not think that the system of tanks could be extended very much.

37. Q. (Mr. Muir-Mackenzie).—Field embankments?—I would try them in the Hoshangabad district. I think in that way a great deal might be done in that district.

38. Q. (The President).—How did the embanked fields do in 1889 when there was a failure of the later rains?—Many of the embanked fields did very well. There were villages in Narsinghpur district which had quite a good crop in embanked fields, when wheat and gram on the unembanked lands failed altogether. It was the same in the famine of 1897. There were some malguzars who absolutely refused to accept the suspension of revenue. But there were a few who accepted it, but they were sorry afterwards that they had not followed the example of others, because afterwards they had to pay up the suspended revenue in a lump. They were quite in a position to do it at the time, but probably they spent the money they had and they found it difficult to pay both the suspended and the unsuspended revenue afterwards.

39. Q. (The President.)—Have you got a satisfactory programme of famine relief works?—The programme has only just been made. Do you refer to big works or village works?

40. Q. Works of all kind?—I do not know anything about big works. The programmes for them are prepared in the Public Works Department.

41. Q. I suppose the Public Works Department are in touch with the Revenue Department?—Yes. They have been working with the Deputy Commissioner. But I have not seen much about big works.

42. Q. I suppose they will come to you for approval?—Yes, they will come to me eventually. For instance, I have not seen the note of Mr. Harriott. Every Deputy Commissioner has been preparing a programme of small village works and one has not had time to examine it as it has only just been prepared.

43. Q. (Mr. Higham.)—Have you any idea as to the extent of the *haveli* tract in the Narsinghpur district?—It is about 60 miles long with an average breadth of 12 miles.

44. Q. A considerable portion of the district?—Yes.

45. Q. Do you think there is much *haveli* land in Hoshangabad?—There is a tract very similar to that in Narsinghpur.

46. Q. It is only in these two districts you have *haveli* land?—Yes.

47. Q. Do you think that the *malguzars* there are anxious to extend bunds?—There is not very much scope now in Narsinghpur. They have done nearly all that is possible there.

48. Q. Have they done a great deal?—Yes. It is only in Hoshangabad they have not taken to it much.

49. Q. You do not think there is much left to be done in Narsinghpur?—There is not very much; but they still go on making embankments, some of them on lands which do not at first sight look promising. They thoroughly appreciate the benefits of embankments in Narsinghpur.

50. Q. There is nothing else to be done for that district?—I do not think so.

51. Q. (Mr. Muir-Mackenzie.)—Wells?—Yes. Here and there wells might be multiplied.

52. Q. Do you think that the failure to push embankments in Hoshangabad is at all due to the character of the cultivators. Are they a less energetic lot?—They are certainly less energetic now than the cultivators of Nimar or Narsinghpur.

53. Q. Do you mean by "now," since the famine?—For the last 5 or 6 years.

54. Q. Prior to that did they enjoy a tolerable measure of prosperity?—They were very prosperous at one time.

55. Q. Their cultivation is slovenly?—It is now.

56. Q. Was it so in prosperous times?—I did not know the district then, but I imagine that it was not very high class.

57. Q. Mainly wheat?—Yes.

58. Q. Would not the extension of embanking increase the danger of rust?—Undoubtedly it would.

59. Q. But the balance of advantage would lie decidedly on the side of embanking?—Yes. There is the experience of the Narsinghpur district.

60. Q. (Mr. Craddock.)—The highest percentage of relief in Narsinghpur was 2 per cent. of the population. That is less by far than that of any other district in the province. Jubbulpore has so many unprotected tracts that you must get the figures for the Jubbulpore *haveli* to get some idea of the advantage of the embanked fields in that district.

61. Q. (Mr. Muir-Mackenzie.)—If there is any possibility of getting any approximation to the actual figures it would be very valuable. How soon would a new embankment begin to pay?—In the second year I should say.

62. Q. Even if you have *kans* grass to be killed, it would pay in the second year?—I do not think it would.

63. Q. How long would it take to kill the grass?—Five years. Natives themselves say 10 years.

64. Q. Is that not by other means than embankments?—Yes. Even if it should be done by embankments they say it would take more than 5 years. But I do not think that it would.

65. Q. If it takes 5 years, would you be prepared to recommend that the recovery of advances made for that purpose should be made after that period?—In

certain specified tracts, where after enquiry it is found that *kans* is very bad, I think I would.

66. Q. What kind of country is the best for embankments. Would you not prefer flat country?—Yes.

67. Q. Have you not seen embankments tried on undulating country?—O, yes. It is tried in several places in Narsinghpur where the country is undulating, but not so very much undulating as to be very pronounced. A field is embanked with the object of catching the rain that falls on it.

68. Q. They carry the bank along a contour in some places and get extra water in that way?—Yes.

69. Q. Are not these embankments high?—The highest embankment that I have seen is about 8 feet.

70. Q. Is that quite an exception?—That is rather an exception.

71. Q. What do you say is the average height?—I should say 4 feet.

72. Q. You say that there is no obstacle to the extension of irrigation arising from sparsity of population. Is not the population sparse in Chhindwara and in Betul?—It is, taking the districts as a whole. But sparsity is chiefly in jungly portions where there is not much cultivation.

73. Q. Are the holdings large or small?—The holdings are small in these two districts. Sausar tahsil is so very different from Chhindwara tahsil that, perhaps, I am wrong in saying that they are small in the Chhindwara district as a whole. They must be large in Sausar.

74. Q. Is there any scope for the extension of embankments outside Hoshangabad and parts of Narsinghpur in Nimar?—Yes. There is a certain amount of scope in Harsud tahsil, the eastern portion of Nimar, where the country is similar to the Harda tahsil of Hoshangabad.

75. Q. Is there any part of your division in which irrigation by *dars* can be extended in places where streams are shallow but hold water till tolerably late in the season?—No. I cannot call to mind any such tract.

76. Q. With regard to wells, are the tracts in which wells could be profitably sunk fairly well defined?—I think so.

77. Q. Can you tell me what proportion they amount to in any district—say for instance in Nimar. Would the wells irrigate about 2 per cent.?—Yes.

78. Q. Do you think that the tracts in which wells could be sunk amount to 5 per cent.?—I think it will, perhaps, be 5 per cent.

79. Q. Not more?—Not more.

80. Q. You say that with such confidence that there would be no good in having an examination of the ground?—I may be wrong.

81. Q. You think that the examination might possibly reveal something?—It might.

82. Q. Do you think that in other districts the examination would be of any use?—Certainly.

83. Q. Can you give me any idea as to the extent of such area in Betul and Chhindwara. I ask these two districts because nothing but wells seem to be possible there?—I do not know whether you could profitably have wells in any areas where they do not exist now. But I think you could multiply wells in those areas.

84. Q. Do you think you can cover 5 per cent. of the area in either of these?—Perhaps hardly 5 per cent. of the whole district in Betul.

85. Q. I say 5 per cent. of the cultivated area?—Yes, I think so.

86. Q. And in Chhindwara?—Yes, in Chhindwara too.

87. Q. I suppose there is no hope of a higher percentage being reached. In other parts of India there is an enormous percentage—in the Punjab 50 per cent. and in some parts of the Madras Presidency 25 per cent.?—I am afraid not. It could not be much exceeded.

88. Q. With reference to *takavi*, in which of your districts do you consider the cultivators to be most broken?—In Hoshangabad and Betul.

89. Q. In these districts is there any chance of getting rid of any considerable sum of *takavi*?—I think so, especially now in Hoshangabad.

90. Q. How are you to get rid of it among impoverished cultivators?—Special proceedings have been taken in Hoshangabad to rehabilitate these people. Revenue has been remitted with consequential remis-

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sion of rent; the revenue demand has been abated and conciliation proceedings are now going on with the object of reducing the cultivators' debts to their paying capacity. They have been set on their legs again, and I think it will be possible, if not immediately at any rate in a short time, to press the taking of loans on them.

91. Q. You could stimulate *takavi* perhaps by postponing recovery?—Yes; but in the Betul district the cultivators are a poorer lot. There are a number of Gonds and Korkus, and they are very unlikely to take *takavi* for land improvements.

92. Q. You said just now that in certain areas loans of certain kinds were pushed and success was obtained in the advancing of large sums. May I gather from that that you agree that it depends very much upon the extent to which it is pushed as to how much can be advanced?—I think so. I mean that one can apply the experience gained in the matter of agricultural loans proper to land improvement loans to certain extent. For instance, I remember 15 years ago, the Deputy Commissioner of Wardha, Colonel Scott, was able to get out an enormous amount of money—at any rate what was then considered an enormous amount.

93. Q. Can you tell me what it was? Was it as much as a lakh?—It was between Rs. 30,000 and Rs. 50,000. It was then thought extraordinary.

94. Q. Have you any hopes of getting at that figure for a series of years—Rs. 30,000 a year?—Yes.

95. Q. Or perhaps more—half a lakh?—Yes, not immediately of course.

96. Q. Do you think that it would facilitate your doing this if you knew beforehand that for the next few years you would have half a lakh to disburse for every district?—I thought you meant for the division.

97. Q. I meant half a lakh for a district. Do you think it is too sanguine?—I think it can be worked in some districts in the course of 5 or 6 years.

98. Q. Not immediately?—No.

99. Q. Would it facilitate your operations if you had a certain amount placed at your disposal for a certain number of years—say 5 years?—It would certainly.

100. Q. Do you know on what grounds the advancing of money beyond 15 years is made the subject of special sanction by the Commissioner?—I do not know.

101. Q. Would you be prepared to see that sanction abolished?—Quite.

102. Q. People you say deepened wells in famine. Was it done out of their own resources or was *takavi* advanced for the purpose?—Very little *takavi* was given.

103. Q. Do you think that more would have been done if more *takavi* had been given for the purpose?—Possibly in Nimar, but nowhere else. It was chiefly in Nimar that people did these things out of their own resources. A great deal of well deepening was done in Betul and Chhindwara. In Betul it was done almost entirely with famine money. The contrast was great in this respect between Nimar and Betul. In both the districts the famine was very severe. In Nimar people deepened wells with their own money, but in Betul not at all.

104. Q. There the work was done by famine labour?—Yes.

105. Q. Not even by malguzars?—It was done by the malguzar, but he was paid money for it. He managed it as a village work.

106. Q. Would it be a good kind of village work?—Under the particular circumstances it did good. Wells were deepened in places where such deepening was very much needed. But I do not know that, speaking generally, it is a very ideal kind of work for employing famine labour on.

107. Q. Do you think that the wrong sort of people were put on?—People were put on who would not have otherwise gone to relief works, but for the fact that the work was in the village.

108. Q. Do you think that with a little bit of supervision it was possible to have employed people who would have gone to relief works?—I do not say that nobody of that kind was employed.

109. Q. Do you think that it would have been possible to have eliminated those who would not otherwise have gone to relief works?—I do not know if so much supervision would have been possible. It was a small work and the object was to get the work done.

110. Q. The object of my question is to ascertain whether the subject of deepening wells had been seri-

ously suggested for famine labour?—Speaking generally, it was not a fit work for famine labour.

111. Q. I suppose the deepening was chiefly done for drinking purposes?—Yes.

112. Q. What is the nature of a *kachcha* well in these parts. Is it merely a hole in the ground?—A *kachcha* well, pure and simple, is a mere hole in the ground, but that is not very common; they generally face it in some way.

113. Q. The number of temporary wells comes to some hundreds and thousands?—The temporary wells in the statistics include what we call *kachcha-pakka*.

114. Q. What is a *kachcha-pakka* well?—It is a well which is not entirely a masonry well. There is a certain amount of *pakka* work where the well is faced.

115. Q. Is it faced on all four sides or is it only faced on the side on which the *môt* works?—Generally on all the four sides. In some places it is faced on the *môt* side only.

116. Q. Has the work to be renewed every year?—Not every year.

117. Q. How long would it last without renewal?—Sometimes 4 years, sometimes 6, and sometimes 10. It is so very varied.

118. Q. There are very few really *kachcha* wells?—I do not know of very many.

119. Q. You say that you are not in favour of the construction by Government of wells in land which is private property. Do you think it would not be useful in some areas in which well irrigation is slack, but where the soil is suitable, for the Government to make a well and work it as an example?—There would be an opportunity of doing that in Court of Wards villages. There is absolutely no objection to doing it there; but I doubt very much whether it would be a good thing for the Government to do.

120. Q. Just to set an example. I do not intend to suggest that the Government should construct them for the cultivators?—If there was a chance of the example being largely followed, it would be a good thing to set the example.

121. Q. If successful cultivation under wells was demonstrated, don't you think that people would follow that example?—Yes, I think so.

122. Q. There is a considerable decline of sugarcane cultivation in Betul?—Yes.

123. Q. To what do you attribute that?—I think it must be attributed to bad seasons. People who grew sugarcane have become impoverished, and hence it has been dropped and dropped for ever.

124. Q. Did the decline not begin before the famine?—The decline seems to have set in after 1892-93.

125. Q. I understood from other witnesses that the decline has been a matter of some years, and it has been attributed to competition of sugar from outside?—It may be due to that. But I am sorry to say I have not considered that point.

126. Q. Would you be disposed to employ famine labour upon embankments?—I think so; but of course there is the difficulty of doing improvements for a private individual somewhat capriciously to the exclusion of other equally deserving individuals. It is difficult to select particular fields, but as a form of labour it is distinctly a good form.

127. Q. Would you first of all select the best place apart from the question of individuals?—Yes.

128. Q. Then, perhaps, the place where there is the keenest demand?—Yes.

129. Q. You would also be limited by the condition of the population?—Yes.

130. Q. A good many factors would come in?—Yes. The probability is that the best place would belong to the soundest cultivators.

131. Q. The keenest demand might arise there, but I should not have thought that they would necessarily be the best sites. When you have a large tract of land a good deal of it might be overgrown with *kans*, and I should think that a good many elements would come in to correct that invidious distinction?—There would be great many considerations.

132. Q. There would be no difficulty in people giving up their land and allowing you to enter on it for the purpose?—I cannot say that about all cases. There seems to be at present a prejudice against embankments in the Hoshangabad district. On the other hand a man of the Narsinghpur district would be delighted to let you have his land to embank.

133. Q. So it is important to take the earliest opportunity to set an example and to show to the people

what can be done and how these embankments would pay?—Yes.

134. Q. (Mr. Rajaratna Mudaliar.)—To follow Mr. Muir-Mackenzie's question—Was famine labour employed to any considerable extent on embankments?—It was employed in Narsinghpur, where, however, we soon closed the works because they were not required, and also in one place in Hoshangabad. Narsinghpur is the district in which embankments are most popular, and that was the one district in the province where there was no famine.

135. Q. (The President.)—Do you put that down to embankments?—It may certainly be put down partly to embankments.

136. Q. (Mr. Rajaratna Mudaliar.)—Have you any idea of the extent of the embanked area in that district?—I am sorry to say I do not know.

137. Q. Would it be half the whole area or one-third?—It would not be more than one-third of the whole. I am speaking quite at random.

138. Q. I believe these embanked fields are exempted from enhancement of assessment until the next settlement?—Yes.

139. Q. At the end of that period what, approximately, would be the difference in the rate of assessment between embanked fields and fields which are unembanked?—I am afraid I cannot say that without referring to figures.

140. Q. Approximately would there be a difference of 25 per cent. in the assessment?—I do not know if it would be as much as that.

141. Q. Would it be so great as to deter people from extending this system?—I think not. I mean if one can judge from experience. I am sorry I cannot give the exact figures.

142. Q. As regards exemption several proposals have been put forward. One was to prescribe a fixed period of exemption, say 30 to 50 years, from the date of the improvement. Another was the *muafi* grant which, according to Mr. Sly, would be the grant of a permanent remission of one-eighth of the assessment. Mr. Low was in favour of granting a permanent remission of assessment on a certain area; which would you advocate in order to encourage people to undertake improvements?—I should be inclined to grant a permanent exemption of a certain area for improvements effected.

143. Q. Would you be prepared to go further and to adopt the Madras and Bombay system of granting a permanent exemption of enhancement and of having the lands treated as dry lands?—I understood that was what Mr. Low said.

144. Q. Mr. Low said that a permanent area should be exempted from all assessment as a sort of *Inam* grant. In Bombay and Madras the system is that all lands benefited by private improvements are classed as dry permanently and they are liable to enhancement only like other dry lands are, without any wet assessment being imposed thereon. Are you prepared to advocate that system in this province, at any rate in the case of lands benefited by wells?—I am afraid I am not prepared to say that I would advocate it.

145. Q. You see the wells are very few?—Yes.

146. Q. The whole area irrigated in the province is only seventy-five thousand acres?—Yes. That makes it all the more difficult to form an opinion because there are very little data to go upon.

147. Q. Does not that fact add weight to the proposal to grant a permanent exemption?—Yes, undoubtedly. But I am afraid I have not considered that point.

148. Q. The loss of revenue would be very little even if the area be trebled?—Quite so.

149. Q. What is the general condition of private tanks? Are they in fair order?—No. I think their general condition is bad. A great many of them were improved during the recent famine. Just before the famine very few were in good order.

150. Q. It was suggested that the Government should give a grant-in-aid and so contribute a share of the cost of repairs to tanks because it derives a portion of the wet revenue?—There is practically no wet revenue from tanks in the Nerbudda Division.

151. Q. The number of tanks is very few?—Yes, practically none at all. There are very few irrigation tanks. Such tanks as have been used are intended for drinking water and cattle, and even these have fallen into bad repair. Speaking generally, for instance, there is only one tank, the Lachora, which is used for irrigation in Nimar. There is one in Narsinghpur and there are not more than three or four

in Hoshangabad, so that practically there are no irrigation tanks in my division.

152. Q. With regard to the Lachora tank, what is the reason of the large falling off in the area irrigated by it?—from 300 acres to less than 100 acres?—The tank went out of repair.

153. Q. Not the enhancement of water-rate?—I do not think so. I think it is due to the fact that it became impossible to irrigate so large an area.

154. Q. There is a very large decrease in the wheat area in the Nerbudda Division. What is that due to; has wheat been replaced by other crops?—It is due to a variety of causes. The wheat area increased up to the year 1891 which, I believe, was the great year for the export of wheat. Then the export of wheat fell and the area under wheat also fell. Then came the two famines, and after each famine it was the one idea of the people to get some food crop as soon as possible, and so a large area which was formerly under wheat was put down under kharif. These are some of the causes which led to the decrease in the wheat area.

155. Q. The area under irrigated wheat shows a large increase. I suppose the irrigation is under wells chiefly?—Yes, except, perhaps, under the Lachora tank.

156. Q. (Mr. Muir-Mackenzie.)—About the exemption which is allowed for improvements, do people apply readily for *sanads*?—No. My experience is that they do not apply for them very readily.

157. Q. Is that to be attributed to the fact that they do not set much value upon exemptions?—I think it is due to apathy and indifference; and also they have not realised the value of exemptions.

158. Q. I suppose that a man's holding is enhanced as a whole?—Yes, as a rule.

159. Q. That probably obscures the effect of exemption?—I think so.

160. Q. They would appreciate *muafi* if they were given it?—Yes, because they would distinguish it at once.

161. Q. Do you think that *muafi* might be proportioned to the value of exemption?—Yes. That might be done with advantage.

162. Q. (Mr. Craddock.)—In the famine of 1896-97 the number of people on relief in Narsinghpur rose to as high as 16 per cent. In 1899-1900 the number never exceeded 2 per cent. Do you think that the previous year's rust had something to do with the larger numbers on relief in the first famine?—Yes, I think it had something to do with it. That is to say 1893-94 and 1894-95 were exceptionally wet years, and in both those years wheat suffered very considerably from rust, and no doubt crops were bad on that account.

163. Q. Were you there in 1896-97?—I left the district in November 1896.

164. Q. From your knowledge of the district, can you say whether the numbers that were on relief came from hilly tracts in 1896-97 or whether they were contributed by the central *haveli*?—There were enormous numbers on relief. I must confess that it has always been a puzzle to me that Narsinghpur should have had so many as it had in that year. I think if I remember aright it was the second district in the province for numbers on relief. In the first famine it was admitted that there was a great deal more wandering; a large number of wanderers came into the district—Bhopalis and people from other parts of the Central Provinces—Damoh and Saugor and the Plateau districts.

165. Q. Can you give any idea as to the location of works in Narsinghpur?—My impression is that the works were on the edges of the district but not in *haveli*.

166. Q. (Mr. Muir-Mackenzie.)—The location of works would be a pregnant fact?—Yes.

167. Q. They were deliberately kept out of *haveli*?—That is my impression.

168. Q. (Mr. Craddock.)—There is another point in connection with the *haveli* or wheat districts. Supposing you can insure a full crop in these wheat tracts, would it not materially protect the Plateau districts adjoining?—Yes, certainly, because the Plateau districts provide so much labour at harvest time. Betul and Chhindwara people come down to Hoshangabad and Narsinghpur, and if you could ensure a good wheat crop, it would give employment to Chhindwara and Betul labourers always.

169. Q. In Chhindwara and Betul you did make some tanks in the last famine?—Yes.

170. Q. There were several—50 or 60 I believe—made by Mr. Chapman who was very enthusiastic?—Yes.

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171. Q. Have any of these been used for irrigation?—Two or 3; but I think, as a matter of fact, events have proved that most of the others were failures.

172. Q. (The President.)—Is that due to the unwillingness of the people to take to irrigation?—Partly due to the fact that they don't hold water.

173. Q. (Mr. Muir-Mackenzie.)—Is it because that the sites were not well chosen?—Sites were chosen in a majority of cases by the Public Works Department.

174. Q. (The President.)—Some will improve by degrees by puddling themselves?—Yes.

175. Q. (Mr. Craddock.)—There is no particular reason why you should not make tanks that will hold water?—Yes. The Public Works Department were handicapped. They were told to select sites close to existing works, and they had to take the best sites available within a reasonable distance of those works; the tanks were a sort of annexe to big road works in order to provide more employment for the people.

176. Q. And also, I suppose, people there had no experience in tank making?—That is another factor.

177. Q. Do you think that if you could make tanks successfully in Chhindwara and Betul, you could protect the light soil areas—I mean the more level ones?—Yes.

178. Q. And you could introduce rice cultivation there?—Yes. I do not see why you should not.

179. Q. You will have to educate people up to growing rice?—Yes. It will be an uphill work in the beginning, but there is no reason why with perseverance the attempt should not succeed.

180. Q. If the experiment should succeed, you could protect a very large area?—Yes.

181. Q. Similarly with areas in Sohagpur, Gadara, Narsinghpur and in the hilly tracts you might

succeed in the same way?—Yes, provided that the tanks held water.

182. Q. We are assuming that the tanks succeeded?—If you could find suitable sites for permanent tanks, there is no reason why, to a certain extent, cultivation should not be protected by those tanks.

183. Q. Suppose in your Plateau districts you were able to protect level light soil tracts and to improve well irrigation in the valleys, and at the same time to improve and secure by bunding fields the valley districts where all the harvest comes, do you think that you would get a very fair protection for Plateau districts?—Yes, certainly.

184. Q. At all events, I suppose you would reduce the famine relief required very materially?—Yes, certainly.

185. Q. (Mr. Muir-Mackenzie.)—I understood Mr. Phillips to say that there was no scope for the extension of bunding in the Plateau districts.

186. Q. (Mr. Craddock.)—In Chaurai and Lingar tracts bunding is not possible.

187. Q. (Mr. Muir-Mackenzie.)—What is that tract?—It is rather a level tract in Chhindwara bordering on Seoni district.

188. Q. Is it a wheat tract?—Yes. All round Chhindwara is a wheat tract, and I do not see why embankments should not succeed there. Hitherto they have never been tried.

189. Q. (Mr. Craddock.)—Are there any similar tracts in Betul?—There is a small area round Badnur in the Betul tahsil and another round Amla in the Multai tahsil.

190. Q. Was there much distress in Multai tahsil?—A great deal.

191. Q. Chiefly among grows of kodon and kudki?—Yes. The level area is very small in Multai tahsil

SUPPLEMENT.

R. H. CRADDOCK, Esq., I.C.S., Officiating Commissioner, Nagpur Division.

Replies to printed questions.

Mr.
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Craddock.

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1. Q. My experience is based on general information gathered while Assistant to the Settlement Commissioner, Settlement Officer, Nagpur, and Officiating Settlement Commissioner. I have more detailed acquaintance with the Nagpur country, and more especially with the Nagpur district, than with other parts of the province.

3. Q. (1) Sparsity of population. In some of the more jungly rice tracts, such as the zamindaris of Chanda, there are natural facilities for tank construction, which are not utilized on account of want of means and enterprise of a sparse aboriginal population; but in the open country failure to extend irrigation is due more to want of means than to sparseness of population.

(2) *Insufficient supply of cattle.*—I have never heard of this being ascribed as a cause. It is true that irrigation bullocks require to be strong and well fed, and the poverty or indebtedness of a garden cultivator may have compelled him to abandon well irrigation, but this has been for want of money to buy or feed cattle, not for want of cattle.

(3) *Insufficient supply of manure.*—People are wont to concentrate their manure on their best rice lands, and doubtless a good deal of rice land is not sufficiently manured, but so far as rice is concerned mere difficulty of obtaining manure has never, I think, stood in the way of irrigation. In the case of well irrigation the cost of manure is an expensive item, and therefore forms a part of the obstacles to the carrying on of well irrigation by an impoverished cultivator. It is want of capital rather than of manure which operates in individual cases. But much of the manure supply is wasted.

(4) *Unsuitability of soil to irrigation.*—There can be no doubt that wherever the soil is suitable to irrigation and the cultivators belong to good farming castes, efforts have been made, if feeble and scattered, to utilize the natural advantage, and you will, of course, find the most irrigation in the tracts most suited for it, and where it is easiest and cheapest to carry out, and most profitable as compared with non-irrigation. There is practically outside Nimar very little irrigation of wheat. There are special tracts, such as the Jubbulpore *haveli* and the Powni-Chauras of Bhandara, in which land is specially embanked for wheat. This practice is capable of being extended, and recent dry years have encouraged its extension; but wheat crops grown in this area are liable to rust

in wet years, and in undulating country water scour is a serious hindrance—the embankments are washed away. Well irrigation for wheat is practised on a small scale, but it is rare for a well to be sunk for this object. So long as the people can get profitable crops of cotton, juar, linseed, tur, wheat, and other pulses without irrigation they are not likely to spend money on irrigation works.

Until the recent cycle of dry years wheat fell into the category of crops which are as often damaged by excessive rain as by drought, and the main cotton and juar crops will always be grown without irrigation. How far the black cotton soil can be irrigated for wheat on a large scale is entirely a matter for future experiment. As yet there has been no special irrigation work for wheat, though in dry years the people are glad to use for wheat any existing resources which are available.

(5) and (6) *Uncertainty of supply and lack of capital.*—I take these two together, as they are intimately connected. The caste which has done the most for tank construction are the Kohlis of Bhandara. They have spent large sums on tanks, but have very large families and are very extravagant, and they are unable to keep their tanks in repair in many cases. With the exception of a few large tanks or lakes, there are none which will have any appreciable supply of water in the end of the hot weather. They require a heavy fall in July to make them to supply water during August, September, and October. In 1899 the July rainfall failed, and hence the existing tanks were of little or no value. In 1896 the rainfall to the end of August was normal or above normal, and the larger tanks saved a great deal, and could have saved more had the water been more carefully consumed. The year 1899 has, therefore, been the only year in which existing village tanks failed altogether; but the small tanks and ponds are always liable to failure in the event of a scanty rainfall or prolonged break.

Even the existing village tanks are of immense benefit to the country, but they are liable to the following defects:—

- (i) If the owner is an absentee, or in debt, or otherwise impoverished, the tank falls out of repair; or
- (ii) the tank is not deep enough or strong enough for the volume of water when rain is specially heavy; the tank is breached and the water wasted;
- (iii) the arrangements for sluices are defective or non-existent, and the bund has to be cut;

(iv) the catchment area is too small to fill the tank.

These are the chief defects in our village tanks; the existing ones might be improved and new ones constructed if the individuals who happen to own them chance to be possessed of means and enterprise. Some have the means without the enterprise, some the enterprise without the means, and many neither. But apart from these disabilities, which are personal to the individual, there is one great obstacle to irrigation on a large scale (the only scale which can ensure immunity from famine) which is common to all our malguzars. They have not the command of the land; they cannot go outside their own village limits, and even within them they are prevented from taking land belonging to others or held in tenant right which must be submerged by the proposed tank. Until power is given by law for acquisition in such cases this obstacle cannot be removed unless such large works are undertaken by Government. Even in that case the acquisition of land for a tank by a landlord should be made legal of course, subject to many safeguards as to the *bona fides* of the acquirer, his ability to construct the tank, and its utility to the village community.

(7) *Fear of enhanced rent or revenue assessment.*—I do not for a moment believe that this has ever militated against the construction of a well or tank. Many of our largest tanks were constructed in pre-settlement days; a very large number of wells were made under very heavy assessments on gardens which the Maratha Revenue Officers taxed to the utmost. Large numbers of thekaders in our zamindaris constructed tanks with five-year leases and exorbitant *Nazaranas*. Besides these uncertainties of rent and tenure, the fear of the rent enhancement or revenue enhancement, which a Settlement Officer would be likely to impose, would be small indeed.

A Marwari buying a village might perhaps consider the chance of enhancement in spending money on improvements, but we should be giving the ryot credit for much more foresight than he possesses, if we believed that he calculates up beforehand the exact profits he will make from a well. He is far too improvident to do this. He knows that irrigation has been found paying, and he trusts to chance. He is quite right so far as the Government revenue is concerned. On the other hand fixity of tenure is an incentive to improvement; and when thekaders have improved their lands, they did so with a reasonable hope of having their leases renewed thereby. It is believed by some that more improvements used to be made by thekaders under the old farming system than by our malguzars, the reason being that the improvement would lead to fixity of tenure. With this assured, this incentive is removed and it remains a question of profit. There is a certain amount of truth underlying this belief, but I think that the tendency to improve is increasing. Of late years, however, there has been the will, but not always the means.

4. Q. Exemption from direct enhancement on account of the improvement is allowed for the next settlement following the improvement (and in special cases for one settlement more.) It follows from my answer to Question 3 that I consider this sufficient. The period is generally too far ahead and uncertain to influence the ordinary cultivator. If he is not deterred by fear of a remote enhancement, he is not likely to be encouraged by a hope of a future exemption.

It would be possible no doubt at a sacrifice of revenue to encourage improvements by remitting revenue altogether, a present and tangible gain which the most ignorant would appreciate. The sacrifice would be a great one and the privilege would be abused, but we might remit revenue on land submerged by the construction of a tank, and this concession would be appreciated. I consider that perpetual exemption from enhancement is an unnecessary sacrifice of the interest of the State. If the work is a large one the exemption may continue under existing rules for 40 years, and the value of the improvement can certainly be recouped in that time.

5. Q. Loans for land improvement are not freely taken by the people as a general rule. That such are available is generally known, but the vast majority would be unable to say what are the terms offered. This is not surprising among people who cannot state their revenue demand without looking at their books. The ryot who has actually taken *takavi* loan will frequently give a very inexact account of his agreement. Delays are common in dealing with such applications, enquiries have to be made and certain formalities are required. These enquiries are often pursued in a very leisurely fashion; the applicant has to produce witnesses who do not turn up, the Tahsildar is asked to

report on the state of the holding and takes time to do so, or his report is incomplete and is returned. These delays might be partly obviated by more energy on the part of the officials, but are not entirely avoidable, as Government is bound to protect itself, as well as the interest of an applicant's creditors under Section 5 of the Act.

On the other hand I think that more might be done in inviting applications in the villages.

The rules as to the terms on which loans may be given are fairly elastic, in that powers are given to the Commissioner or the Chief Commissioner, as the case may be, to grant special terms as to the amount of the loan, the rate of interest, or its postponement; but I believe that these special concessions have been very rarely recommended.

More free resort to the special concessions might be tried, and more efforts made in the villages.

The allotment for land improvement loans in this province has never been large, and the district allotments have consequently been small. It frequently happens that applications received and not disposed of towards the close of one financial year are hung up for want of communication of the allotment in the next financial year. This causes further delay, and the convenient time for utilizing the money has perhaps passed. We have not sufficient information regarding rejected applications, and the discouragement which they may have caused.

In regard to the specific recommendations mentioned in this question—

- (1) I do not think it necessary to reduce the ordinary rate of interest, but I would not levy compound interest, or penal interest.
- (2) I would remit interest during the period required for construction.
- (3) and (4) I do not think it necessary to remit any portion of the advance.
- (5) I would extend the term for repayment of the first instalment in the case of new works to the period allowed in Rule 14.
- (6) I would only recommend grants-in-aid in the case of very substantial works over which there is professional supervision.

6. Q. We have not had irrigation on a sufficiently large or concentrated scale to allow experience of this tendency. If we merely irrigate existing cultivation in settled villages there would be little scope for such a movement. If, however, we were to take a large jungle and provide good irrigation and throw the tract open to cultivators we should draw people away from other tracts, at all events in rice country. On the other hand a nucleus of irrigated land in a village enables the dry lands in the neighbourhood to be profitably cultivated.

The idea of Government irrigation works is as yet too novel for the people to move much in the matter, but directly that one or two substantial works are found to be successful we shall have numerous requests for similar advantages elsewhere.

D.—TANKS.

23. Q. As regards heads (1), (2) and (3) of this question, Mr. Harriott's enquiries have been more recent than my own and relate to

larger areas. I have nothing to add to them except to refer to the "turams" or *kachcha* sluices which in many tanks obviate the necessity of direct cutting of the bund, and to draw attention to the great advantage enjoyed by the lands immediately under the tank bund from percolation.

As regards head (4) it is of course difficult to say; so much depends on the size and situation of the tank. For the purposes of the returns the term irrigation tanks includes many *boris* or ponds which much reduce the average area irrigated for tank. We may take it that an ordinary major village tank will irrigate 50 to 100 acres.

24. Q. Putting out of the question garden crops proper which are almost entirely dependent upon irrigation, and more than treble the rent-paying capacity of the land if grown with dry field crops, the effect of supplying irrigation to wheat land will, so far as experiments on a small scale show, enable the yield to be raised from an average of, say, 500 or 600 lbs. per acre to about 1,000 lbs.; in individual years it would add little or nothing, in some years it would add 25 per cent., in some it might cause actual loss.

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In rice tracts irrigation will enable a second crop to be grown on a soil too poor to ordinarily produce it, and it will enable the finer varieties of rice to displace the early and coarse varieties. An ample supply of irrigation would restore some of the area of sugarcane. The local production has greatly declined of recent years, and the imports of unrefined sugar have increased.

Its effect on the yields of rice would be—

- (1) In a year of ample rainfall to largely increase the yields on the poorer and lighter soils, say from 400 to 1,200 lbs.; on the better lands it might increase the yield by about 50 per cent.; on the best soils and low-lying lands the effect would be much less perhaps, not more than 25 per cent., or even less. But even in years of ample rainfall it is seldom so well distributed that there is no loss on some land.
- (2) In years of scanty rainfall the advantage would be much increased, while in (3) a year of drought it makes the difference between a normal crop and nothing at all.

I take the following figures from enquiries which I made when Settlement Officer of Nagpur ten years ago:—

Average yields per acre.

Soils.	Position or lie of land.	Irrigated rice.	Value of second crop.	Unirrigated rice.	Value of second crop.
		lbs.	Rs.	lbs.	Rs.
Black soil I	Flat	1,600	12	1,230	5
" " II	"	1,600	9	1,230	4
Black soil I	High-lying.	"	"	1,000	Nil.
" " II	"	"	"	920	Nil.
Light soil I	Flat	1,230	Nil.	800	Nil.
" " II	High-lying.	"	"	480	"
" " II	Flat	1,040	Nil.	640	Nil.
" " II	High-lying.	"	"	440	Nil.

In the above figures the advantages of irrigation are shown at their minimum. Rice land was not very important in Nagpur and irrigation was not differentiated to the same extent as in the Bhandara country.

In fixing upon the irrigation values it was therefore necessary to allow for the inferior character of much of the irrigation. It may be taken therefore that the above figures under-rate the advantages of really good and constant irrigation. The advantages, however, even under this estimate, if we take the net profits, are very marked. The following figures show thus:—

CLASS OF SOIL.	NET PROFITS PER ACRE, INCLUDING DOUBLE CROP, IF ANY.			
	Irrigated.	Unirrigated.		
		Flat.	High-lying.	Mean.
	Rs. a.	Rs. a.	Rs. a.	Rs. a.
Black soil I	16 0	10 8	5 10	8 0
" " II	14 0	9 4	4 6	6 12
Light soil I	8 2	3 12	1 8	2 10
" " II	6 0	2 8	1 0	1 12

These figures are of course liable to variation absolutely according to prices, but relatively, I think, that they are generally correct. The higher the yield the larger the net produce, although the cost of cultivation on the best soil may amount to Rs. 15 per acre and on the worst only Rs. 6.

The conclusion is that, taking the average of unirrigated soils in all positions, irrigation will double the net profits in black soils and quadruple them in light ones. Indeed, in some of the better light soil fields reliable irrigation would allow a second crop to be grown, in which case the advantage from irrigation would be still greater.

This conclusion is the more entitled to acceptance as while the estimated yields of the unirrigated soils are by no means low, those of irrigated land were especially kept at a moderate figure to prevent inferior irrigation from being over value. The character of the irrigation from large reservoirs, with unfailing supply, would fully justify an estimate on the best lands of 2,000 lbs. as against 1,600 lbs. assumed in these calculations, an increase of Rs. 10 in value.

In years of drought the enormous advantage of irrigation can be judged from the fact that while the yields on the irrigated lands would be maintained, those on the unirrigated would shrink largely on the black soils, and be practically nil on the poor soils.

Inasmuch as the larger portion of our rice is grown on the light soils, the advantages of large extension of irrigation cannot be gainsaid.

28. Q. So far as the cultivation of rice is concerned, the general standard rates of rent paid per acre may be stated as follows:—

	Irrigated.	UNIRRIGATED.	
		Flat.	High-lying.
	Rs. a.	Rs. a.	Rs. a.
Black soil I	3 2	2 2	1 4
" " II	2 13	1 14	0 14
Light soil I	1 10	0 12	0 5
" " II	1 4	0 8	0 3

So far as the rental is concerned, the average extra rent paid varies from Re. 1 to Rs. 2 per acre for irrigated land, but here again the general standard had to be fixed with reference to inferior irrigation. On the best irrigated lands Rs. 2 an acre extra may be assumed as a fair certainty, with possibilities of at least Rs. 3 per acre when the certainty of the irrigation is appreciated by the people.

So much for rice. As regards wheat experience is very limited. In very dry years the people would pay a good deal for water for their wheat, but in many years they would not care to pay much, and in some years they would pay nothing. That is present experience. How far the existence of regular irrigation would result in the production of a wheat which requires and can stand it without danger of rust is a question which experiments alone can determine; but at present it might well happen that wheat irrigated in November or December would fall a victim to rust engendered by cloud and rain in January and February.

The thicker and heavier the crop, the greater the devastation. Since the year 1895-96 there has been need for irrigation at one period of the cold weather in each year, but in 1896-97 and 1900-01 there was subsequent heavy rain, which would have been most damaging to heavy irrigated crops. In 1891-92 irrigation would have been beneficial, but in the three following years it would have been useless if not harmful.

I don't believe that on an average even Re. 1 an acre would be received extra for irrigation on a large scale.

31. Q. This is generally provided for in the shape of Water-rates and distribution rent, as in the vast majority of cases the tank belongs to the landlord, and the water is used by the tenant. But there are a certain number of tanks owned by private persons and used by tenants of another landlord. In these cases a water-rate is taken by the owner and is computed at so much per khandi of seed capacity, and is generally rendered in kind.

The same is the case when the tank of one village irrigates the land of another. To the best of my recollection these rates worked out to about Rs. 2 per acre irrespective of the rate of rent which the land paid. The distribution of the water is inexpensive and gives rise to dispute; only when in years of scanty rainfall, the supply is not equal to the demand. The landlord generally has the fields best situated for the supply, and supplies all his needs before a drop is avail-

able for anyone else. One occasionally hears of disputes and sometimes rioting in connection with irrigation, but these cases are surprisingly few. Custom however is a great power, and it is custom which decides all these matters. Except in respect to any Government irrigation, one is tempted to let well alone. It is one of the cases in which legislation might produce litigation.

32. Q. I consider that the people should be encouraged to make tanks. Whatever be the decision of the Government in respect to State irrigation, it will be a very long time before the scope for useful village tanks is exhausted. Every device for the storage of water is of use in a rice country. Even when these fail in years of drought, they save much loss from untimely breaks in ordinary years, and the cultivator is better able to tide over a period of distress. It was this alone which enabled the poorer landlords and more substantial tenants to pass through the famine without resort to Government relief; and it was probably the absence of these which brought the population of Chhattisgarh on to relief in such large numbers.

Even if the area protected against all but the most complete failure of rains is small, it assures to the country a seed supply. These tanks saved an enormous quantity of rice in 1896-97, and enabled the area sown in 1897-98 to be a comparatively full one, while in 1900-01, as a result of the more complete failure of 1899, the supply of seed was totally inadequate.

The encouragement of tank construction may be effected by giving the most liberal terms of *takavi* which our rules permit and by grants-in-aid in the case of really expensive works.

E.—WELLS.

34 to 36. Qs. I do not believe much in wells in this district as a preventive against famine. Each well commands too small an area to be of much use for the major field crops, and they are constructed almost entirely with a view to garden crops, which produce a large yield on a small area. In a group of villages

round Waroda, about 15 miles from Nagpur on the Bhandara Road, there are some localities where water is nearer the surface than in any part of the district, 10 to 12 feet only. Within that area there were 123 wells of a durable character and some *kachcha* wells. These irrigated some 400 acres of land of which only 12 acres represented field crops, and the rest were used for raising garden produce. Where garden cultivation is abandoned the well is abandoned too. If a man happens to have a well, in a dry year he will give water to a crop that is handy, but he will seldom or never go to the expense of making a well simply for irrigating a field crop.

Temporary wells are sunk in the beds of streams for drinking water for men and cattle, and I have seen a few used for a garden patch, but they are of little general use in a black-soil country, and it is not the faintest use attempting to construct them to save the crops in a year of drought like 1899. A durable well may be said on an average to cost about Rs. 250 to Rs. 300 and to command on an average from 2 to 3 acres, but if used for field crops requiring only occasional watering they would command a larger area. The expenses are heavy and though the value of the produce may rise from Rs. 25 to Rs. 100 per acre, the net profits are not very great. Garden cultivators as a body are generally not very prosperous, and the cultivation is not infrequently abandoned for field crops. The garden cultivator will pay from Rs. 5 to Rs. 10 an acre, and if rack-rented will pay from Rs. 20 to Rs. 30. A man who owns a well could obtain Rs. 5 an acre for the use of it, provided that it was used to raise valuable garden crops. But if well irrigation were very largely extended, garden produce would fall in value and rent and water rate would fall.

In the neighbourhood of a large town Rs. 25 an acre for well irrigated land might be fair, because of the ready market for garden produce.

I am convinced that well construction must be left to private enterprise assisted by ordinary loans. The loan of boring tools and the assistance of professional borers would be useful, and with these facilities we may expect the extension of well irrigation wherever it is of proved advantage, but in my opinion the cost of excavation and lift will always militate against the protection of field crops by means of wells.

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B. ROBERTSON, Esq., I.C.S., Deputy Commissioner, Jubbulpore.
Replies to printed questions.

A.—GENERAL.

1. Q. To the Jubbulpore and Nimar districts, of which I have been Deputy Commissioner for 5 and 8 years respectively. As regards Nimar, I shall refer only to the well irrigation I have seen there. The rest of the answers I give should be understood as referring to the Jubbulpore district, in which I am at present serving.

3. Q. I shall not answer all the queries in detail, but shall note on the general situation in the Jubbulpore district as regards irrigation.

The district may be considered as falling into three divisions:—

- (1) the hilly country of the south-east and east.
- (2) the rich *haveli* plain in the south and centre.
- (3) the light soil region of the north-west and north.

In the first of these there is hardly any scope for irrigation. The land is generally light and stony, and the population is largely aboriginal. The crops grown are mainly rain crops, except in favourably situated pockets among the hills, where the land is embanked and where cultivation resembles that in the next division of the district.

In this second division there is rich black soil. The fields are generally surrounded with high banks, which impound the water in the monsoon. In October the bunds are cut, and the water escapes. Rabi crops are then sown, when the surface has become dry enough. For this part of the district, this method of embankment is what is required, and no system of irrigation is necessary. It is only in an exceptional year, such as 1899-1900, when the monsoon rainfall was not sufficient to flood the fields, that damage results. In 1896-97 there were good rabi crops on this embanked land. Even if no rain falls in the cold weather, the moisture retained in the soil is generally sufficient to give an average crop. I can quote the year 1898-99 as an instance. The rabi crops in the *haveli* received practically no rain the whole time they were in the ground, but their outturn was fair. If the rabi on this embanked land is irrigated, and if afterwards the cold weather rainfall is heavy, there is a danger

that the excessive moisture will bring on rust. Speaking generally, therefore, the embanking of the black-soil plain is sufficient to secure the crops, and irrigation has not to be resorted to.

In the third portion of the district, the light-soil tract of the north-west and north, where rice is an important crop, irrigation is feasible; but it has not been practised hitherto, as the rainfall has generally been ample. The recent succession of years of badly distributed rainfall has, however, opened people's eyes to the necessity for irrigation. I do not think that any of the obstacles referred to in this question have kept people from taking to irrigation in the past. The reason is to be sought for rather in the immunity from severe drought which they had for a long time experienced and which they believed to be a normal feature in their method of cultivation.

4. Q. Exemption from enhancement of assessment on account of improvements is provided for in the Central Provinces. I am of opinion that the existing provisions are sufficiently liberal. They are generally understood by the people, who in the Jubbulpore district readily apply for *sanads* of exemption.

5. Q. Loans for the construction of irrigation works—I do not include in this the embanking of fields—have not been taken in the Jubbulpore district hitherto. The reason is that irrigation has, as explained in my answer to Question 3, never been really practised in this district to any appreciable extent. But with the experience of the past 5 or 6 years, I consider that we should encourage people to take loans for this purpose. For potty works in ordinary years I do not think that any special terms are required beyond those that are at present given. But for works on a larger scale, I should say that special terms are desirable. In my opinion the most convenient form of concession would be to give grants-in-aid, the people themselves contributing in money or labour according to their circumstances. In a project which would benefit the lands of one or several villages it would usually be difficult to get the people to combine to apply for a loan which they would have to repay. But if Government comes forward to help them, they will generally be willing enough to join in carrying out a project, which when finished will leave them with no repayments to take. Government can secure the

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benefit of the outlay which is made from the public funds by an enhancement of the assessment, proportional to its share in the total cost. If minor irrigation works (as distinguished from large projects carried out by the Public Works Department) are to be undertaken on anything like a comprehensive scale, I consider that this is the plan which will give the amplest results.

C.—CANALS OF INTERMITTENT FLOW.

12. Q. (1) Under this heading come small irrigation channels, supplied by temporary dams thrown across a river-bed. This is a form of irrigation which people have taken up in the past year or two in some places in the Jubbulpore district with marked success, and I am of the opinion that we should do everything possible to make the system general. In the case of small streams a temporary bund costs very little to make, and we can leave it to the people to carry out the work at their own cost. But so backward is the general run of cultivator in devising workable projects of this kind, that I would suggest a regular examination being made of sites for constructing such small bunds. This is in a way being done at the present time in connection with the preparation of famine Note-books. Suitable sites being fixed upon, the people should be prevailed on to throw up temporary bunds. Even if not required for watering their rice, the bunds will often enable them to sow rabi on an extended area. Without some slight pressure, it is surprising how little the ordinary cultivator will bestir himself to carry out a work like this for the benefit of his land.

In some instances it may be found advisable to have masonry dams built across streams. Works of this nature the cultivators could not do unaided, and Government would have to step in with advances or grants-in-aid.

(2) & (3) The system of constructing temporary dams has been so little resorted to, that it is difficult to give any general principles as to distribution and method of watering deducible from present practice. I have found in some cases that no regular channels for conveying the water are made: it finds its way on the surface from field to field. This plan will generally be possible where rice land is irrigated. In the same way the number of waterings given is not uniform. Sometimes, besides watering the rice crop, the rabi is watered at sowing time and given another watering, if no rain falls, four or five weeks later. But I have also found the cultivators burst the temporary bund and thus shut the water off from their fields, immediately after they have sown their rabi.

The most suitable practice the cultivators will readily find out for themselves. What is wanted is to get them to exert themselves in the matter and to resort regularly to this system.

D.—TANKS.

23. Q. Tank irrigation has been so little resorted to in the Jubbulpore district that it is not possible to give very definite answers to this or the following questions. Until the present year hardly any use was made of the existing tanks, by actually drawing water from them and bringing it on the land. The tanks benefited the surrounding fields by percolation, and the best and heaviest rice would frequently be found sown under the tank bund. In the famine of 1899-1900 a large number of tanks in the third division of the district, which has been mentioned in the answer to Question 3, were repaired or constructed by famine labour. Use has been made to some extent of these and of other tanks in the present year, when the mon-

soon rainfall failed early. They would have been more extensively used had earlier orders been given to the people to take the water. Such orders were found necessary, first because there was a general impression that the bunds of the newly-repaired tanks were not to be breached without permission, and, second, because the people in many cases would not take the initiative in using the water their fields so badly needed. I had to employ the services of Government officials and Local Board members to go round and see that the tanks were being actually drawn upon. I think the result has been to make the people really understand that irrigation is not only possible from their tanks, but is highly advantageous. It is a new thing to which they have not got accustomed, but if another year of deficient rainfall should come, I have no doubt that there will be much greater alacrity in making the tanks serve the purpose for which they are intended.

The ordinary method of distributing water from the tanks was to cut an opening in the bund. The water was thence distributed on the surface of the rice fields. No distributary channel was as a rule dug, and I think that such a channel will not ordinarily be required in the case of small tanks irrigating some 30 or 40 acres of rice land below the bund, such as most of our tanks are.

Irrigation would not be necessary in a year of ample rainfall for the rice crops, but the tanks might be drawn upon for sowing a second crop. In a year of scanty rainfall the tanks should secure the rice crops, although not holding enough water to enable a second crop to be sown on as large an area as usual.

26. Q. Wells can be of no use in supplementing tank irrigation for rice. The supply of water from a well is not sufficient to flood a rice field to the extent required. And our tanks will be primarily used for rice irrigation, if the people stick to the lead which has been given them in the present year.

32. Q. I think the construction by private persons of further tanks is in every way to be encouraged. The grant-in-aid system referred to in my answer to Question 5 seems to be the best way of securing the object.

E.—WELLS.

34 to 40. Qs. The chief experience I have had of well-irrigation in these provinces is in the district of Nimar. Nimar has a very light rainfall, and without well-irrigation rabi would be a very precarious crop. I should encourage the making of wells in this district, where it is the only form of irrigation that is thoroughly practicable.

In Jubbulpore the only people who practise well-irrigation are the Kachhis, who use it for growing garden produce, potatoes, etc., in their enclosed fields near village sites. I do not think that well-irrigation can be extended very much in this district. It would be of no use for rice and is also not required in embanked rabi land. There are some places where it might possibly be worth while giving well-irrigation a trial on an extended scale. One such is the south-east corner of the Murwara tahsil, where there is good light soil which should grow any kind of crop with a constant supply of water, and it would be difficult to get such a supply without resorting to wells.

I do not think that Government should construct wells. The best plan, in my opinion, to encourage their construction would be to give advances with extended periods of repayment and with partial remission of the advance in tracts where the shaft has to be sunk to a great depth or where for other reasons well construction is specially expensive.

H. HALLIFAX, Esq., I.C.S., Deputy Commissioner (on leave).

Replies to printed questions.

Mr. H.
Hallifax.
31 Mar. 02.

1. My answers refer to the Chanda district. I was Settlement Officer of the district for two years, Assistant Commissioner there for about another year, and officiated as Deputy Commissioner for another year.

3. (1) The population is certainly sparse, being, as far as I remember, 130 to the square mile, if we exclude from consideration the 3,200 square miles of Government forest. This is, however, no obstacle to the extension of irrigation, as almost all the irrigated land under cultivation will bear irrigation, and land which cannot be irrigated will be given up for new land which can. Security of irrigation in bad years, however, seems more important than its extension, and cultivators appreciate this. Men in the habit of buying water have told me that they are prepared to pay 50 per cent. more for water which they can depend on getting in a bad year. (2) The supply of cattle is ordinarily far from insufficient, and even now after

the drought of 1899 and 1900 there are few complaints. The cattle in the rice tracts, which form the greater portion of the district, are of a small hardy breed, exactly suited to the cultivation of irrigated land. (3) Manure, too, is at present sufficient, though sadly wasted. (4) The soil throughout the district (with the exception of a strip running down the east banks of the Wardha, Pranhita and Godavari and varying from twelve or thirteen miles to two miles in width) is mainly a very sandy loam, known as "wardi," which most requires irrigation and derives the most benefit from it. (5) to (9) I do not think any of these matters are likely to prove an obstacle to the extension of irrigation.

4. (b) The existing provisions for exemption from enhancement for land benefited by an improvement seem liberal enough, but they press very unevenly. In Chanda a number of improvements were made dur-

ing the famine of 1897. As the settlement is now being made, these will earn exemption for about 20 years only, whereas improvements made just after a settlement mean exemption for as much as 60 years. A definite term of years might be fixed. I would suggest 40 or 45. Then at the settlement following the making of the improvement, the Settlement Officer could fix (a) the number of years during which exemption would still run, (b) the rent payable during that period, (c) the rent payable from the end of that period till the next settlement.

5. Loans under the Land Improvement Loans Act have always been freely and even eagerly taken. No measures seem to me to be required to make them more popular.

6. The unirrigated tracts in the Warora Tahsil and in the Wardha District growing cotton and juaari have existed long enough side by side with the irrigated tracts of Brahmapuri, but the former are still more thickly populated and closely cultivated than the latter. Any movement there may be will be from unirrigated land which requires irrigation, that is, mainly rice land. There is throughout the district the very strongest desire to have the facilities for irrigation increased, and great gratitude is expressed for the repairs and additions to old tanks and the construction of new ones which was carried out in the famine.

23. (1) Practically every tank in Chanda is built by throwing an embankment across a depression from one high-lying side to the other, and the water is the surface-flow from the higher land behind and on both sides. "Bunds" across perennial streams scarcely exist. Where there are such streams they are led directly on to the fields. (2) The larger tanks are provided with masonry outlets or "turums," practically all of the same pattern. The rough sketch of a section in the margin will show how they work. The top of the funnel in each step is provided with a wooden or stone plug, which is made fairly water-tight with clay. In smaller tanks without a "turum" the embankment is cut near one end where it is not very high, and in the smallest tanks or "boris" it is cut in the middle, the bed being used later for wheat or gram. Channels a few inches deep take the water to the fields and

is run then from one to the other. (3) (a) In a year of good rain the tank supplies water for irrigation till November, and there is then still sufficient for watering cattle and household purposes till the next rains. The very best tanks under which sugarcane can be grown give a regular stream all the year round for that crop. (3) (b) In a year of scanty rainfall the best and the smallest tanks will still give a fair supply for the rice crop, but the tanks without "turums" give very little as the "bund" is too big to cut at or near the middle. (3) (c) In a year of drought there is practically no water to be had from any tank as they all depend on the rainfall and there is at present scarcely one that holds more than one year's supply.

24. (1) It is not likely that irrigation will increase the double-cropped area very much. Most of the rice land is a very sandy loam—scarcely a loam at all. (2) Better kinds of rice, however, will be substituted for inferior kinds, as has already happened, and sugarcane cultivation will increase. With irrigation, too, the rice is planted in nurseries and transplanted out. Without, it has to be broadcasted. (3) In a normal year the yield of irrigated rice is from 30 to 50 per cent. more than that of unirrigated. In a year of drought the difference in yield would, of course, depend on the intensity of the drought and the efficiency of the irrigation.

30. The Wajib-ul-arz provides for the maintenance of every tank. In many cases the owner has to do this himself, but in most cases all tenants who get water from the tank have to contribute in labour or cash to its maintenance. The cost is small, the repairs being ordinarily nothing beyond repairs of small breaches and the strengthening of weak places during the rains. The system seems to work satisfactorily.

33. The silting up of tanks is slight. The only measure taken to prevent or remedy it is to take any earth required for repairs or additions to the embankment from the bed.

34 to 40. There is not much well irrigation in Chanda and all I have to say about it I have said in my note printed as an appendix to Mr. Harriett's.

SHANKAR MADHO CHITNAVIS, Esq., C.S., Deputy Commissioner, Sambalpur.

Replies to printed questions.

A.—GENERAL.

1. Q. Sambalpur District.—I have up to date been able to tour through a major portion of the Sambalpur Tahsil. I have not yet been able to visit the Bargarh Tahsil.

3. Q. Irrigation is of vital importance in this district. The soil consists generally of the detritus of crystalline rock, lying in great measure *in situ*, and but little affected by alluvial action. Rice is the main crop of the district and overshadows everything in the system of cropping. Water is an important factor in its cultivation. The configuration of the country is exceedingly well adapted to tank making, and it is not too much to say that the very existence of villages over a large portion of the district is dependant on the tanks which have been constructed round them.

(1) Only in certain tracts, such as the Borasamber and Phuljhar Zamindaris.

(2) Not in this district, as water is an important factor in the cultivation of rice.

(3) None, as even without manuring irrigation is very beneficial.

(4) The soil is specially suited for irrigation, and without it does not yield a good crop even in ordinary years. Black cotton soil is almost wholly absent in this district.

(7) Rents are generally low and easily collected. So fear of enhanced rent does not come in the way of extension of irrigation.

(8) All tenants have occupancy rights.

(9) At last Settlement all tanks which were not included in *bhogra* were entered in the name of Government, and this the people urge has discouraged them from making new tanks. But this has no force in it. The Wajib-ul-arz expressly authorizes ryots to make tanks in their own holdings and *gaontias* in their *bhogra* without permission, and on land forming part of the village waste with the permission of the Deputy Commissioner.

5. Q. Loans are not freely taken under the Land Improvement Act. Tank construction is not very expensive and people can, I think, find out the requisite

capital otherwise. In backward tracts loans may be given without interest and partial remission of the advance. In others the present terms are reasonable.

6. Q. Not in this district. The more irrigation is extended the better.

D.—TANKS.

23. Q. (1) The ordinary tank is constructed by throwing a strong embankment (called a *kata*) across a drainage line so as to hold up an irregular shaped sheet of water. Below the *kata* a four-sided tank is excavated called the "bandh." The "bandh" derives its water by filtration from the "kata." An embankment of small size thrown across a drainage channel is known as a "munda."

(2) Irrigation is generally effected by leading channels from the ends of the "kata" embankment, but in years of short rainfall the centre of the tank is sometimes cut through.

(3) Ordinarily up to the end of November for irrigation of superior rice and in big tanks throughout the year for irrigation of sugarcane and for drinking and washing purposes.

In a year of drought the supply of small tanks is used up before the end of October and that of big tanks a month or so later.

(4) Depends on the size of the tank.

24. Q. (1) Two harvests are not taken in this district.

(2) Lands which grow inferior crops, such as kodo, kulthi, and are used for the growth of rice or sugarcane.

(3) (a) 50 per cent., (b) 50 per cent., (c) 100 per cent. For instance land capable of producing 100 lbs. of rice without irrigation would produce with irrigation:—

	With Irrigation. lbs.	Without Irrigation. lbs.
In a year of ample rainfall .	150	100
In a year of scanty rainfall .	100	80
In a year of drought .	100	Nil.

26. Q. Not done in this district in the case of rice, but only in that of sugarcane. Most of the sugarcane

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plots which are situated in ryoti holdings, and not on the sugarcane plot which is common to the village, are irrigated from wells.

27. Q. The increase varies with the lie of the land and is as follows:—

	per cent.
On Bahal	12
On Berna	25
On Mal	66

28. Q. (1) None generally. In a few cases it varies from 4 to 8 annas an acre on area actually irrigated.

(2) None in this district, as all ryoti land is the property of Government.

(3) The following is the scale of factors adopted at the last Settlement:—

	Bahal.	Berna.	Mal.	At.
Ordinary	18	16	10	3
Irrigable	20	18	16	...
Khari	20	18	16	...
Irrigable and Khari	24	...	18	...

29. Q. Very little expenditure is necessary for bringing water to the field or to prepare land for irrigation. It is incurred by the tenant. The average cost of embanking land for rice cultivation is Rs. 2 or Rs. 3 an acre, if no forest growth has to be cleared. In the latter case, it is about Rs. 10 an acre.

A.—GENERAL.

1. Wardha District.—I was in charge of the district for four years, from 10th April 1897 to 30th March 1901.

3. Q. (1) The district is thickly populated.

(2) There is a sufficient stock of good cattle in the district. The Arvi cattle are noted in the Nagpur country.

(3) None.

(4) The soil is for the most part black cotton soil and not suited for irrigation on a large scale.

(6) No lack of capital, except at present in the Hinganghat Tahsil.

(7) None.

(8) Under the law at present in force ordinary and occupancy holdings are not transferable by mortgage, long lease or sale.

(9) The main crops of the district are cotton and juar, occupying about three-fourths of the area under crop. In the Arvi Tahsil these crops occupy almost 90 per cent. of the cropped area, in Wardha about 85 per cent. and in Hinganghat 75 per cent. Rice is an insignificant crop occupying not more than 6,000 acres, and only inferior kind of rice is grown broadcasted, without any irrigation. Tanks are few and far between. Several of the old tanks have been brought under cultivation, and those that exist as such, excepting those that were improved during the last famine, are not in good repair. They are not used for irrigation purposes, but for village "nistar." The only tank from which irrigation is made is the one at Haldia-Waigaon in the Hinganghat Tahsil, where turmeric is grown. Juari and cotton do not require much rain. A rainfall of 30 inches is quite sufficient for these crops, provided it be seasonable and evenly distributed.

30. Q. Tanks which have been recorded as the property of private individuals are maintained by them, and those that have been entered as the property of Government are maintained by the village community as a whole. The cost of repair is in the latter case borne by the villagers in proportion to their means and is not raised at a rate per acre. The silt is removed by the villagers annually in the hot weather and spread over their fields for manure. Many old and useful tanks are, however, reported to have been neglected and so something stronger than the provision contained in paragraph 1 of clause IX of the District Wazib-ul-arz and at the same time simpler procedure than that laid down in Section 120 of the Land Revenue Act, XVIII of 1881, is necessary to keep the tanks in good condition.

31. Q. The owner of the tank regulates the distribution of water and complaints are settled by the Deputy Commissioner in a summary way through his executive staff by arranging a compromise. Government assistance in this matter is quite necessary.

32. Q. This is certainly advisable. By the grant of loans on more liberal terms in certain tracts, and generally by granting them much quicker than they hitherto have been.

33. Q. No.

E.—WELLS.

34—39. Q. Irrigation from permanent wells is not attempted in this district. Hence these questions are not answered.

40. Q. Yes, for irrigating sugarcane. These can be used with advantage for irrigating rice in a year of drought, and the average cost of making them does not exceed Rs. 7, but the people are disinclined to hard labour and do not take full advantage of the plentiful store of sub-soil water at no great depth from the surface.

tributed. The configuration of the country is not well adapted to tank-making.

5. Q. No. They were taken freely during the last famine, but not before. Irrigation from tanks is practically unknown in the district. It is done from wells for the growth of garden crops. Wells are expensive to make. They have to be dug to a great depth before water is reached, and on hard rock being reached, which is frequently the case, blasting has to be resorted to.

Loans may be given free of interest for construction of irrigation wells.

6. Q. Not in this district.

D.—TANKS.

As irrigation from tanks is not attempted in this district, these questions are not answered.

F.—WELLS.

34. Q. (1) 25 to 30 feet.

(2) Both from springs and percolation even in ordinary years, the wells run very low during the hot season and a number of them run totally dry.

(3) 250 to 300.

(5) By means of "môts" drawn by bullocks.

(6) 10 acres.

(7) 2 acres.

37. Q. Rents are fixed for the terms of a settlement, except in the case of ordinary tenants, and irrigated lands are assessed according to the factor adopted in their case by the Settlement Officer.

4. Q. Yes, for the growth of garden crops and watering sugarcane. They are no protection against drought.

Note on irrigation in the Central Provinces by R. H. CRADDOCK, Esq., I.C.S., Officiating Commissioner, Nagpur Division.

(Member attached to the Commission during its enquiries in the Central Provinces.)

In the following Note I have set down the conclusions which I have formed on the subject of irrigation in the Central Provinces, as the result both of previous experience of the province and of my tour with the Irrigation Commission.

2. The subject-matter of the note is considered under four heads:—

I.—The agricultural circumstances of the province, showing the extent to which irrigation is already practised.

II.—The measures which should be taken by the State itself to extend irrigation.

III.—The means and extent to which private effort should be stimulated and assisted in providing or improving irrigation.

IV.—The immediate practical steps to be taken to bring about the objects desired.

I.—The agricultural circumstances of the province, showing the extent to which irrigation is already practised.

3. An account of the agriculture of the province as it was in normal times, and of the effects upon it of the series of bad years which culminated in 1896-97, is

Reference invited to reports on the famines.

given in the Report on the Famine of 1896-97, Chapter I (paragraphs 12 to 26), and this account was subsequently brought up to date in the first chapter of the Report on the Famine of 1899-1900 (paragraphs 15 to 31). A reference to these paragraphs will save an overburdening of this Note with a number of details and figures.

4. Soil, rainfall and sub-soil are the main factors in determining the different agricultural practices in various parts of the province. In respect to the two first, we are in possession of fairly complete information; but as regards the last, which is also possibly the most important, our knowledge is extremely meagre and unappreciated.

For instance, subject to correction by anybody with scientific knowledge, I would account for a very marked agricultural difference between our deep black soils in different parts of the province by peculiarities of the sub-soil or underlying rock. In the areas to the west of the province, comprising Nimar, the Sausar Tahsil of Chhindwara, the portions of Nagpur and Wardha which lie to the west of the Pench and Wunna rivers, respectively, and a strip of country along the Wardha river in Chanda, it will generally be found that the underlying rock is trap, that the stony uplands consist of trap rock as yet imperfectly disintegrated, that the poorest plateau and slopes will produce with good rainfall fair crops of juar and cotton, and that the light millets *kodon* and *kutki* are hardly at all grown; while in the valleys and deep-soil fields these same crops, cotton and juar, flourish alike in dry and wet years, wheat being as a rule less successful, and sometimes only yielding a crop with irrigation.

These are also the tracts in which the rainfall is lightest. Even in dry years losses on the uplands are generally made up by the crops grown in the lowlands. In 1896-97 these tracts escaped famine. In 1899-1900 they pulled through better than most places, except when the July rainfall totally failed and the young seedlings withered away. In 1868-69 also they escaped almost unscathed. They are the most prosperous tracts in normal times, and are making the best recovery from the recent failures.

5. There are also enormous areas of black soil to the east of the boundary line which I have roughly indicated. But it carries wheat without irrigation, and juar and cotton fail upon it in wet years, and do not thrive upon it except in dry years. These crops are generally produced with success only in particularly well-drained land, generally on sloping fields near river banks. In these areas elevation of surface generally brings to the top light gravelly or sandy soil, which can only produce small millets and grasses or light autumn oil-seeds. In all these districts subject to particular exceptions, the underlying rock is granite, sandstone or laterite, and it is unusual to find black soil in hill situations.

6. I believe that a good deal of geological controversy has centred round the origin of the black soil. Some assert that it owes its colour to decayed vegetable matters, other that it is merely disintegrated trap. It seems possible that both theories are correct, and that wherever it is made up largely of disintegrated traps, the soil will be found in upland situations, and generally less retentive of moisture in lowlands; while where it consists merely of surface alluvium, it owes its colour decayed organic matter, and is only to be found in level or lowlying places.

You will sometimes find a heavy wheat-growing black soil in a village which lies low in a trap area, but the deep soil village which will grow cotton but not wheat in level fields is a rarity in the non-trap areas.

7. Whenever the underlying rock of sandstone or laterite comes to the surface in level plains the land is best for rice cultivation, and the bulk of our Wainganga and Mahanadi rice tracts fall within this category. In Sambalpur, in fact, black soil is almost totally absent.

8. The agricultural practice in the matter of selection of cropping is, however, greatly influenced by environment. Where there is a large preponderance of light soil suited rice, rice will also be grown on the adjacent black soil; where cotton and juar are the prevailing crops, they will be grown on fields which might better produce wheat; where the heavy soil suited to wheat is most prevalent, wheat will also be grown on the light soils which should be cropped with cotton and juar. Want of communication has intensified the effects of immediate

environment in the past; and we see these effects in the present day in the manner in which black soil is devoted to rice in Chhattisgarh, or rice neglected for hill millets in Mandla and the plateau district. Custom (*rawaj*) has influenced the character of the cultivation. This effect of environment is a fact which it is important to keep steadily in view in any irrigation programme; for although irrigation may be most rapidly and usefully extended in tracts in which it is already practised, its absence is far from being conclusive proof either that it is impossible or useless.

Has some importance in the matter of irrigation.

9. While, however, we may strive to improve agriculture by improving land which is not used to its full capacity owing to the prejudice of its environment, it would be folly to suppose that the main system of cropping of each tract is in itself unsuitable. We may certainly accept the facts that the trap country with its light rainfall and well-drained black soil is best devoted to cotton and juar; that the heavy soils of the Nerbudda valley are best suited to wheat, and that the light yellow and red soils of the Wainganga and Chhattisgarh must always look to rice as their principal product. We may remove the prejudices, but we cannot change the environment.

10. The same principles must be followed in devising irrigation schemes if success is to be attained. In the wheat country we must provide a system of irrigation which is suitable for wheat, in the rice country for rice. Only if we find in the wheat or rice country a tract or kind of land which would in the rice or wheat country, as the case may be, be devoted to rice or wheat respectively, is it desirable to encourage, and provide irrigation for, an alteration of the cropping.

11. As will appear from the extracts from the Famine Reports to which I have drawn attention, until the famine of 1896-97 the people of the province had suffered as much from excessive as from deficient rainfall. Premature withdrawal of the rains or dry cold weathers had of course been experienced, but the losses suffered had always been local and partial, and attention had been given to irrigation only when irrigation was an incident to the raising of the particular crop which the locality favoured, that is to say, in the case of the heavier varieties of rice, sugarcane, and garden produce. When the practice was, as in the Wainganga districts, to grow transplanted rice, irrigation was more developed and understood; whereas in Chhattisgarh, broadcast cultivation of rice was the common method, it was much neglected, or confined to particular classes of cultivators or particular villages. The cultivation of cane and garden crops was a luxury to be enjoyed only by the well-to-do, or by special communities of garden cultivators of the caste variously known as Malis, Kachhis or Marars, who had generally settled of choice in places where water was near the surface and wells easily sunk.

With the single exception of rice cultivation it never entered into anybody's head that the irrigation of a field crop might be desirable, and the irrigation of wheat was confined to small patches subsidiary to a garden crop. It must be admitted that there has not been sufficient time for the people to change their practice.

12. The statistics we have are subject to errors and defects, but they are sufficiently accurate for all broad issues. I select the figures of 1895-96. It was a year in which the rains withdrew early, and it was the first dry year to succeed a number of wet ones. The state of irrigation in the province before the rude awakening took place may be judged from the figures of that year. The first table which I give shows the distribution of the irrigated rice area:—

Existing statistics of irrigation.

TRACTS.	AREA UNDER RICE IN 1895-96.		
	Irrigated.	Unirrigated.	TOTAL.
	Acres.	Acres.	Acres.
Northern districts excluding Seoni.	358	520,433	520,796
Wainganga rice districts in Nagpur Division plus Seoni.	511,476	654,388	1,165,864
Chhattisgarh . . .	153,487	3,140,095	3,293,582

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The difference in practice has been very remarkable.

Tank irrigation of rice.

The northern districts attempt practically no irrigation; the Wainganga district; in Chhattisgarh irrigation is in its infancy; and Sambalpur contributes half the amount shown against the Division. It may be reckoned that a full rice area for the province would be 5 million acres, of which little more than a tenth receives irrigation in ordinary years. In dry years this proportion is lowered by failure of tanks, and in years of complete drought the area protected is infinitesimal in proportion to the whole. Thus the irrigated rice area of the Wainganga districts fell to 451,000 acres in 1896-97 and to 75,000 acres in 1899-1900.

A failure of the rains in these rice districts entails further consequences in reducing the area double-cropped. In the wet year 1894-95 the double-cropped area was 1,716,000 acres. In 1895-96, a dry year, it fell to 1,206,000 acres. In 1896-97 it was only 565,000 acres, and in 1899-1900 it actually fell to 164,000 acres.

13. The enormous advantage to be gained by irrigating the rice lands of the province needs no elaborate argument or proof—a few figures will illustrate it. If we take 1½ million acres of rice in Raipur as the area now unprotected by irrigation, having an average yield of 900 lbs. per acre, then the whole area would yield in an average year 300,000 tons of cleaned rice.

In 1895-96 the late rains were scanty, and the crop was only 60 per cent. of normal or 180,000 tons. In 1896-97 the yield was only a quarter, or 75,000 tons. In 1897-98 the crop was full average; the same in 1898-99. In 1899-1900 the yield fell to about 30,000 tons. If then it be assumed that the average yield were only raised by 33 per cent. (an assumption which is pitched designedly on the safe side) by complete irrigation, the normal produce should be 400,000 tons of cleaned rice.

The account would then stand:—

Year.	Amount harvested.	Amount that would have been harvested with complete irrigation.
	Tons.	Tons.
1895-96	180,000	400,000
1896-97	75,000	400,000
1897-98	300,000	400,000
1898-99	300,000	400,000
1899-1900	30,000	400,000
TOTAL	885,000	2,000,000

The difference in yield during the five years would then have been at least a million tons, or an amount equal to four years' food-supply to the population of the district. But this is not all; for the calculation does not allow for the loss of cropped area after the famine due to want of seed, loss of population, and general impoverishment; nor has account been taken of the value of the second crop. The area double-cropped in the Raipur District in the wet year 1894-95 was in the Khalsa (for the Zamindaris were not then completely surveyed) 579,000 acres. Assuming that, with steady irrigation of the rice, an area of 600,000 acres, with a yield of only 200 lbs. an acre might be annually double-cropped, the normal production of food-grain resulting from the double-cropping would be 120,000,000 lbs., or in round numbers 53,000 tons. But in the series of years following 1894-95, the area double-cropped fell as follows:—

	Acres.
1895-96	317,000
1896-97	205,000
1897-98	355,000
1898-99	378,000
1899-1900	14,000

Even if the area double-cropped in each of these years had yielded the full 200 lbs. to the acre, there would have been a large deficiency below the standard of 50,000 tons; but it was short in most of these years, and in the last it was practically nil.

If the gross losses for want of irrigation during this period be taken as a million and a quarter tons, the

money value of this at the moderate rate of 20 seers to the rupee is represented by no less than 7 crores of rupees. In the two famines Government spent a crore and a half in this district alone on famine relief. Its advances to cultivators have amounted to 15½ lakhs, and its loss in land revenue remitted and in settlement operations postponed would not fall far short of 20 lakhs. It would be no exaggeration to say that, taking all heads of revenue, the loss to Government has been two crores on account of the Raipur District.

14. To irrigate all the rice land of Raipur is of course an impossible task; but some considerable stride in that direction is necessary if we are to save the district from famine. With a population of a million and a half, we require for a year's food-supply at least 250,000 tons of food grain; but there are always some stocks, and with the help given by other crops, we might reduce the amount required to prevent actual famine to half that amount, or 125,000 tons, or even 100,000 tons. At this rate the irrigation of 500,000 acres would suffice as a certainty, and of 400,000 at a pinch. This would cost two crores at Rs. 50 an acre, but by free resort to *tars* the cost might be much reduced.

The scantiness of rainfall has not been at fault so much as its distribution and the ineffective means of storage. Even in 1899-1900 Raipur had 11 inches of rain in August as against a normal of 13½, and Bilaspur 20.74 as against a normal of 11, and well-constructed tanks would have held some water for the much-needed September supply, had such tanks been in existence.

15. The irrigation of rice is at once the most promising and necessary object of the Government, and the first thing to be done, but there are differences in the attitude of the people towards it. We have, besides providing it, to teach irrigation in the northern districts, preach it in Chhattisgarh; while in the Wainganga districts the provision alone will suffice—the people will readily take water directly it is made available.

16. Irrigation from wells plays a very subsidiary part in the agriculture of the province. There is some well irrigation of wheat in Nimar, mainly on soil which does not yield wheat well without it; and the same may be found on a smaller scale in the trap cotton-juar country, especially in the Arvi and Katol tahsils of Wardha and Nagpur. Wheat will also be irrigated on a small scale where garden cultivation has been abandoned. But outside the cotton-juar country there is practically no settled irrigation properly so called, and sugarcane and garden crops grown by special classes of cultivators are the most important instances of well irrigation.

The cultivation of garden crops requires generally some capital and much industry, and the average field cultivator, unless he has some hereditary instincts in that direction, will rarely bethink himself of starting a vegetable garden.

17. So far as these gardens grow only perishable market produce for local consumption, the idea of extending them very largely is perfectly futile; but the case is otherwise with spices, fruits or other produce which is capable of export. For instance, earthnuts (*mungphali*) might be cultivated more extensively. Some years ago a notable feature in the trade returns was the fact that the province had large net exports of chillies. But this was a solitary instance, and in the majority of years there is a large net import of this commodity. In 1900 the value of imported chillies amounted to Rs. 5,39,000, while the exports are only Rs. 28,000. There is thus scope for an increase in cultivation of chillies. The same is true in respect of ginger and turmeric. As regards sugarcane the reasons alleged for a decline are so many and contradictory that one can speak with less confidence. But there is a very appreciable scope for the expansion of garden cultivation along present lines. The crushing assessment on garden industry imposed by the Maratha Government has been considerably lightened by our Settlement Officers at the recent settlements, and the old opium rents have been very generally reduced.

18. The last normal year for which returns are available shows the following details of well irrigation:—

Number of wells—

Temporary	46,564
Durable	12,632
Total	59,197
Area irrigated from wells	77,252

Actual statistics of garden crops.

Number of wells—	Acres.
Temporary	46,564
Durable	12,632
Total	59,197
Area irrigated from wells	77,252

Compare irrigated areas shown as under—

	Acres.
Sugarcane	23,425
Grass and orchards	3,768
Garden crops of kharif season	6,260
Miscellaneous food-crops of kharif season	1,539
Miscellaneous non-food crops of kharif season	299
Tobacco	36
Garden crops of the rabi season	4,601
Miscellaneous food crops of the rabi season	1,282
Miscellaneous non-food crops of the rabi season	22
Total	41,212

Some of the sugarcane is irrigated from tanks, so that if the total well irrigation is correctly stated, there must be nearly 40,000 acres of field crops receiving water from wells. The latest returns have shown as many as 30,000 acres of irrigated wheat over the province at large. There is therefore distinct hope of extension of well irrigation even to field crops, though it would be too much to hope for any efficient protection against famine by this means alone. Even if well irrigation were to be trebled the effect on the harvest earnings of labourers would be small.

Out of the total area of 77,000 acres irrigated from wells, the following districts are those in which the areas are largest, in which therefore the best hope of extension lies :—

	Acres.
Saugor	5,061
Nimar	13,041
Betul	9,002
Chhindwara	6,001
Nagpur	10,127
Raipur	8,583
Sambalpur	3,645
Total	56,260 or 73 per cent. of the whole.

The area of well irrigation is particularly trifling in the districts of Mandla, Seoni and Bilaspur, and in Raipur it is small relatively to the total cropped area.

19. Under the head "Area irrigated from other sources," the returns of 1898-99 show nearly 27,000 acres. This class of irrigation, which in the main relates to water lifted from streams, is of little importance except in Chanda, where 4,000 acres are thus irrigated. It also includes irrigation by channel from banded streams—a form of irrigation which is fairly common in Raipur, being known as the *lar* system, and has latterly been extended in Jubbulpore. The area so irrigated in Raipur in 1898-99 was 7,500 acres, and it appears to be the cheapest form of extending irrigation, in that district at all events.

20. The total irrigated area from all sources in 1898-99 aggregated only 654,000 acres out of a cropped area of nearly 16 million acres, or just about 4 per cent. In the following year it dropped to 1½ per cent., thereby showing the liability of the supply to fail when most needed. Whereas, however, irrigation from tanks and *turs* fell by over 60 per cent., the decline in well irrigation was only 17 per cent.; and whereas the wells in use remained fairly constant, one quarter of the tanks could not be used at all, and few of the rest gave any sufficient supply. For the limited area they will protect the well is therefore greatly more dependable than the tank, but the cost of extensive protection by wells in this province is prohibitive when regard is paid to the limited resources of the cultivator.

21. There remains one kind of quasi-irrigation to be considered, and that is the bunding of fields for wheat cultivation. The bunding of fields for wheat with incidental rice cultivation in level places where the bunds are not obliged to be too high.

We have no annual record showing the extent and progress of banded fields, and it would be most instructive if such a record were available; but in districts re-settled, in which bunding for wheat is a regular practice, the soil classi-

fication effected at the settlement will show the state of bunding at the time. The following table refers to a few districts :—

	Area embanked.	Area under wheat and wheat-gram at Settlement.
	Acres.	Acres.
Damoh	39,411	251,000
Jubbulpore	{ 347,704 (fully) 56,554 (partly) }	461,000
Seoni	10,497	276,000
Narsinghpur	52,220	235,000
Balaghat	18,602	17,000
Nagpur	9,184	320,000

There is also a considerable banded area in the Powni pargana of Bhandara, which extends into the adjoining district of Chanda.

22. The practice of bunding fields for wheat cultivation has received a great impetus from the cycle of dry years, and it continues to spread every year. The spread of *kans* grass in Saugor, Damoh and Hoshangabad has been very great, and bunding is now regarded as the best means of eradicating it. This I believe to be a mistake. If the money spent on bunds were spent on powerful cattle and deep ploughs, and the roots of the *kans* exposed to the hot-weather sun, the weed could be killed; but as the bunding has many other advantages and the eradication of *kans* is one of them, the idea is not one to be discouraged.

As will be seen, there is a certain amount of bunding in most districts, almost invariably to be found in those areas where real black soil is found adjacent to rice cultivation. From there it has spread to the regular rabi areas. There exists scope for the extension of bunding in Saugor, Damoh, Narsinghpur, Hoshangabad, Nagpur, and parts of Wardha, and I should suppose, in Raipur and Bilaspur. There is no chance of the practice being usefully extended in any area where it pays to grow cotton and *juar* even in wet years in rotation with wheat.

23. I must confess that when I started on my tour with the Commission I was somewhat sceptical as to the advantages of bunding. It seemed to be likely that in the experiences of the recent dry years the losses of the rust years had been forgotten. But after hearing the evidence of the witnesses of the northern districts, I have strong reason for thinking that over a long series of years the gains from the system of bunding are greater than the loss. Rai Bahadur Behari Lal Kazanchi, who has spent Rs. 50,000 on bunds, gave strong testimony to this effect, and his opinion has been backed by his actions, since a good deal of the work was done before the years of rust and a good deal immediately after. Although rust does more damage in banded than in unembanked fields, yet when there is an attack of rust such as ruined the wheat crop of Saugor in 1894, there is nothing to choose between them. In years when rust is not so virulent, the extra losses in embanked land are small beside the extra profits made in other years. The actual cultivation expenses are reduced, weeds are kept in check. The tracts which came through the famine pest, and which have deteriorated least, are the Jubbulpore *haveli*, the corresponding areas in Narsinghpur and Mandla, and the Powni-Chauras of Bhandara.

24. For the province as a whole—to wind up this Rough analysis of crop areas part of the Note—the standard and ultimate protection to be taken as follows :—

	Standard area in acres.	Remarks.
1. Rice	5,000,000	Partially protected by tanks 500,000 acres.
2. Wheat	3,500,000	Partially protected by bunds about 500,000 acres; by wells about 25,000.
3. Cotton and its mixtures	1,000,000	Barely requires irrigation.
4. <i>Juar</i> and its mixtures	1,500,000	Do. do.
5. Gram	1,000,000	Partly protected by bunds, and when grown in rice districts as a second crop by existing tanks, but the areas so protected are small.

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	Standard area in acres.	Remarks.
6. Kodol and Kutki.	1,500,000	The only crops possible on some of the slopes of the Satpura districts; but capable of being replaced on level light soils by rice with irrigation, and on the black soils of Chhattisgarh by rabi crops or by juar.
7. Oil-seeds	1,500,000	Not generally requiring irrigation. In the famine year 1899-1900 til gave a very large yield; but linseed failed from drought, and when grown as a second crop after rice, benefits from the irrigation of the rice.
8. Pulses of the kharif season.	500,000	For the most part benefit by the irrigation of rice, which they follow.
9. Pulses of the rabi season.	1,000,000	See gram above.
10. All other kinds of crops.	1,000,000	Includes about 150,000 acres of sugarcane, garden crops, and groves, of which two-thirds are dry.
Grand Total...	17,500,000	Of this 1,500,000 may be taken as second crops grown on rice land.

The net area cropped, that is to say, the area to which water has to be brought, is thus 16 million acres; but we may deduct from this the areas shown against heads (3), (4) and (7), at least two-thirds of item (6), and at least half of items (5), (8), (9) and (10), the omitted portions representing land which is or should be protected by bunds, or is already irrigated or cannot be irrigated. The balance remaining for irrigation will, therefore, be 10½ million acres. The odd 1½ millions will disappear in double-cropping to which irrigation of the rice crop will give protection, leaving 9 millions mostly consisting of rice and wheat land.

We have now half a million acres of rice partly protected by tanks, and half a million acres of wheat partly protected by bunds. We can improve the first, and aim at extending the second. If it be supposed that we double the area of the second and succeed in making the area of the first secure, we have to deduct another million and a half from the area to which water has to be brought. We still have 7½ millions to deal with, i.e., 4½ millions rice, 2½ millions wheat, and half a million other crops.

The protection of a third of the rice area, and a fifth of the other areas, added to the areas protected or to be protected by existing tanks and bunds is, I should think, the utmost to which we can hope to attain, and should indeed suffice to save us from famine, provided that the protection is well distributed.

This would give us—

(a) Rice protected by irrigation	2 million acres.
(b) Wheat and rabi protected by irrigation	0.5 " "
(c) Wheat, &c., protected by bunds	1.0 " "
(d) Other crops protected by wells, tanks, or tanks	0.5 " "
(e) Double crops protected by irrigation of rice	1.5 " "
Total	5.5 " "

The protection of one-third of the cropped area, added to the area which never fails entirely even in the year of greatest drought, e. g., areas shown with cotton, til, juar, etc., should bring us through the greatest drought security.

It is not impossible that this aim might be realized at an expenditure of 12 crores of rupees. The famine of 1896-97 cost the Government about 2 crores; the famine of 1899-1900 about 5½ crores, or 7½ crores in all including loss of land revenue and forest income, but not including all the consequent loss in subsequent years, due to deterioration of agriculture, loss of population, loss of railway revenue, and all the decline in public revenues which an impoverished condition of the people necessarily involves. This brings me to the second head of this Note as to what the State should do.

II.—What the State should do of itself.

25. There are two circumstances in which the State must carry out irrigation projects itself—
Circumstances in which the State should undertake works itself.

Firstly, when the work is beyond the capacity and means of private enterprise;
Secondly, when the advantage of the work is not understood by the private individual.

There are a few large tanks in the Wainganga districts which were found absolutely protective in the famine; but these were constructed long ago, at a time when the constructors had a free hand and were not hampered either by the rights of their neighbours or of their tenants. It is difficult to lay down when a work is of sufficient importance to be constructed by the State. I do not think that the question can be decided by the number of villages which a particular work would irrigate. If one man owns two or three contiguous villages or if the owners of two or three contiguous villages can be got to combine, and the work is not beyond their joint capacity, there is no reason why they should not jointly construct such a work. But if

Difficulties in the way of private enterprise. no such combination is possible, and the work is a desirable one, the intervention of the State will be clearly justified. It may be found possible to assist private enterprise by permitting land to be acquired for a private tank or *far*, if a village community is thereby benefited; but frequent resort to such provisions would be likely to cause much irritation. Even in the case of a State work people whose lands are submerged by a tank from which only their neighbours or perhaps enemies will benefit will be greatly irritated by the acquisition, but such a feeling would be much intensified if the action was taken on their neighbour's private account and to his sole profit.

26. There is an immense field for irrigation in the rice districts, and a large number of projects have already been drawn up, the great majority of which are clearly beyond the resources of any individual.

So far as the large projects in these districts are concerned there is no question as to their utility, and their construction depends upon the allotment of funds. But there are two questions to be settled which are of great importance. The one is as to the terms on which water should be given to the people; the other as to the degree and extent of protection to be aimed at.

27. First as to the terms. The people of the Wainganga will be ready to pay for water at once, they fully appreciate the advantages of irrigation. The people of Chhattisgarh have still to be educated up to the advantages of it. I have no doubt that the education will come very easily, but it will be stimulated by giving them water free for a year or two, or perhaps, three years. In the same way in the Wainganga tracts it would be as well to offer water at a low rate at first, with a full intimation that it will be raised later on. Compounding for an annual payment must follow; no reasonable composition is likely to be offered until the people see how far the water goes, how many waterings they are likely to be able to get, and generally how it has affected their incomes. Anything in the way of free water, or water at a nominal rate, must be offered for a very short time at the outset. The people must be taught to value the water by paying for it, and they must not have time to get used to an enhanced income. Special attention must be devoted to ascertaining details in the first instance; it cannot be left to patwaris or subordinate officials.

28. The next point is, what is to be the standard of protection. Prudential considerations should not be carried too far. It is of course clear that it would be foolish to spend all the water on a single watering of 2,000 acres instead of keeping enough water to protect 1,000. But the prudential consideration can be carried too far. If, for instance, a tank can irrigate 5,000 acres in an average year but would only water 1,000 acres in a year like 1899-1900, it would, I think, be foolish to irrigate only 1,000 acres annually on the chance of that one dry year occurring. It would be far better to irrigate, say, 2,500 acres, every year, and only 500 in the case of extreme drought. This would enrich 2,500 people for say 29 years out of 30, and 1,000 of these would

save half their crops in the famine year. Whereas, on the other method, there would be 1,500 people not a pin better able to resist famine than before, and water capable of irrigating their land would for 29 years have gone to waste. Moreover, the calculations would be entirely upset if a year like 1896-97 occurred; it would be madness in such a season when crops were withering all round, and distress or famine was imminent to retain water on the chance of a future year like 1899. It is better to avert one famine actually on the land than to lay by stores for two famines in the clouds: we must chance something. The difference lies between trying to guarantee a small number of people against total loss, instead of a larger number against actual famine.

20. The enormous effect of credit in averting famine must not be overlooked. If, to go back to my example, the extra 1,500 people, who will be excluded altogether under one scheme, have under the other enjoyed profits for 29 years, they will either have saved enough to carry them over the 30th, when they get no water, or their creditors will know that in the 31st they will get water as usual and give them advances to carry them through. All that is necessary is to preserve a sufficient area to yield a seed supply for the whole of the rice lands which fall, so to speak, within the sphere of influence of your protective tank.

We must aim at years like 1896-97 rather than at years like 1899-1900; first, because it is a kind of failure which, in all human probability, is likely to occur most often; and secondly, because, when it does occur, all considerations of reserving water for some possible future and greater failure must be thrown to the winds.

If a year like 1899-1900 followed a year like 1896-97, no doubt the area protected would be small, but it would still be much larger than if the tank had not been made, and it would fall on a people whose credit and resources were undiminished by previous loss. It will of course be objected that the irrigation of an area subject to large annual fluctuations will involve establishments to ascertain it and collect water rates, while by irrigating a fixed and smaller area an annual sum, to be collected through *malguzars*, can be determined. There ought, however, to be no insuperable difficulty in dealing in the same manner with a larger area in all ordinary years and remitting fees chargeable on lands not watered in years of extreme drought. These must also, I think, under any system be always some surplus receipts from people who take water for sugarcane or *rabi* crops. That there will be difficulties is undeniable, but the best solution will lie in making a tank and seeing how it works.

30. Whichever criterion be accepted as to the degree of protection to be aimed at in each work, the object aimed at must be to protect a certain area in each definite tract of the district which is liable to failure. It is better to aim at diffusion of a measure of protection to a number of tracts, than to make one corner of a district absolutely secure and leave others totally unprotected.

31. Q. While we are preparing and considering the possibilities of large reservoirs, we must not neglect to examine what is known in Raipur as the *tar* system of irrigation. Mr. Blenkinsop has shown that in the *khalsa* areas of Raipur, an expenditure on village tanks of Rs. 2,35,000 in the famine has added about 23,000 acres to the irrigable area. Labour was, of course, often insufficiently supervised, and sites badly selected on account of haste and want of experience, but if every allowance be made for this, the advantage in favour of *tars* is remarkable. Of these he writes: "The few *tars* constructed, where they did not burst, irrigated areas out of all proportion to the expenditure incurred, e.g., the Patharia *tar*, costing Rs. 2,601, irrigated 400 acres, and the Tandwa *tar*, which cost Rs. 5,834, including also the cost of repairs to the Tandwa tank, irrigated over 500 acres. The Tora *tar* cost Rs. 1,770 and irrigated 420 acres."

If these results are even approximately accurate the advisability of a number of cheap *tar* schemes would be indicated, not only in Chhattisgarh, but in other districts where the system is at present little known.

32. The second case which was referred to in paragraph 25 above as a case in which the State was bound to do work itself is the case of improvements of which the value is not known by

the people. There are possible projects for tanks in the northern districts, which, if constructed, would either irrigate existing rice, or enable rice to be cultivated. There are also possible tanks to irrigate wheat on the lighter varieties of wheat land. But no individual will be willing to

lay out capital on a work of the utility of which he is not himself satisfied, and in many cases the State would have to take the risk of the experiment proving a partial failure, or a very expensive success. If, however, a real effort is to be made to protect the country some risks of this kind must be run; but in order to save the chance of heavy loss the experiments should be on a small scale.

33. There is in Nimar the Lachera tank, of which so much was heard in the evidence before the Commission. The tract in which it is situated is known as the Kanharpur-Beria tract, which resembles more the Nerbudda valley wheat country than the lands of Nimar. This tank should at once be removed from the control of the District Council, be repaired and improved, and the effect be tried of lowering the rates at present charged. It is believed that, if improved as proposed, it would irrigate 500 acres, and this is about the scale of tank which should be a maximum until the experiment of irrigating wheat land can be shown to be successful.

A good deal was said in Nagpur about the Ramtek project. This is a very ambitious reservoir, which is estimated to cost ten lakhs of rupees and to be capable of irrigating 36,000 acres. The two arguments against the scheme are that it is a costly work to select as an experiment, and that on the whole it will irrigate a country which was not severely distressed in the famine. On the other hand there is a good deal to be said in its favour. Firstly, the area to be irrigated contains a substantial amount of rice land, as well as a considerable area of garden cultivation; secondly, much of the soil is light and a good deal of land might better be used for rice than wheat; thirdly, while possessing these advantages the work would show how far wheat would be irrigated on black soil. Lastly, some villages within the area did suffer a good deal in the famine.

The country which the project would serve has therefore most of the characteristics which would influence choice for the purpose of an experimental project, and the only doubt is the expense. The same money might perhaps produce greater results elsewhere.

35. Again, as already stated, much can be done in some districts to educate the people up to rice irrigation, both in the Nerbudda valley districts and in the plateau districts. In Seoni the influx in the south-east corner of Powars from Balaghat resulted in some very excellent rice cultivation, but this area is cut off from Chhindwara by a wheat-growing *haveli*, and the light soil on the other side of this land has never been used for rice. There were 50 tanks constructed, repaired or improved in Chhindwara in the famine, but as Mr. Phillips told us in his evidence, only three of these have been used for irrigation, and few of them were found to hold water.

It is inconceivable that tanks cannot be made which will hold water in Betul and Chhindwara, and it is certain that many good sites could be found. But the people must be taught how to cultivate rice by importing rice cultivators to teach them, just as the Agricultural Department is now teaching some of the Bilaspur cultivators how to grow *juar*.

36. So far as tanks and *tars* are concerned there is thus scope for much useful experimental work of a not very costly kind, which will show the way to private enterprise. There is less to be done by the State in the way of bunding fields and sinking wells. This work must be left almost entirely to private effort. But even in the cases of these works there are places in which the initiative may properly rest with the State.

In parts of the province where the bunding system is unknown, or the people bankrupt, a few of these works might be made by Government. If they were successful private enterprise, assisted, if necessary, by *takavi*, would no doubt go on with the work. Similarly a great deal of land in the south of Nagpur is being spoilt by erosion, and some specimen reclamation worked of this land would be most useful.

Lastly, in respect to wells, in Chhattisgarh they have had to be constructed by public funds in order

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to induce the people to drink well water, and it would be equally desirable to encourage wells for irrigation. Wells sunk under the bunds of tanks in what are known as the 'pajra' areas have been found most serviceable in some parts of Madras and Hyderabad, and the Sambalpur witness spoke of them in Sambalpur. Any idea of saving the Chhattisgarh rice crop by means of wells in the case of drought, or any hope that the Chhattisgarhi will take to sinking wells by the hundreds when he sees his rice crops withering, must alike be regarded as illusory.

But in these matters the proverb that "every little helps" should never be derided. If there are wells to hand already constructed, even the Chhattisgarhi can be got to use them in time of need, and though they may not produce much food, they will at least help to maintain a seed supply. We learnt from a Raipur witness that special shifts were made during the famine to preserve some seed supply, and a small sum at least might be devoted to introducing the Hyderabad practice.

We are endeavouring now to introduce an agricultural association of leading agriculturist malguzars in every district, the members of which will, it is hoped, undertake in their villages, and report upon the most promising experiments which the Agricultural Department or their own members may bring to their notice. Efforts will be made to induce them to extend various methods of irrigation, and a little State aid in this direction will prove most serviceable.

III.—The means and extent to which private enterprise should be stimulated and assisted in providing or improving irrigation.

37. The conditions which I have ventured to indicate as determining whether the State should undertake works entirely from its own resources also afford the criterion as to what should be left to private enterprise. The traditional refusal to interfere with private property went by the board in the second famine; firstly, because it was felt that it was most undesirable to again press famine loans upon an impoverished people; and, secondly, because the programme of useful work on roads could not meet the demands for employment. The decision to improve, repair, and construct malguzari tanks was popular with the people and has resulted in much useful work. The amount of work carried out in this way is described in paragraphs 204 to 206 of the Report on the famine of 1899-1900, and the amount spent was as much as 67 lakhs. Greater results would have been achieved had a carefully-devised programme of such works existed when the need for them arose, and such a programme is now under preparation. The question naturally arises whether such work as the enlargement or improvement of village tanks should be left to the chances of another famine, and whether the better course would not be to minimize the chances of famine by increasing the protective value of these tanks.

38. According to the returns of 1898-99 there were 41,977 irrigation tanks being used in the province, out of which over 25,000 are to be found in the Wainganga country, including Seoni; 7,500 in Sambalpur; and 8,000 are tanks in Raipur and Bilaspur. The owners of these tanks are theoretically bound to keep them in a state of repair, but they are not, even theoretically, under any obligation to improve them.

Where the proprietors are of cultivating castes on good terms with their tenants, there is a good deal of co-operation in the matter of ordinary repairs, and the proprietors will, if they have the means, occasionally incur a considerable outlay in major repairs or improvements; but with absentee landlords owing a number of villages, energy and money are seldom devoted to this object. It is true that there exists a power to notify an infringement of the Wajih-ul-arz with respect to the tank clause, but I can only recollect one or two cases in which the enforcement of that clause has ever been notified, and I am unable to say what the results were. It may be that if more pains were taken to enforce the clause before neglect had gone very far, some good may ensue. But if you fine a man Rs. 200 for failing to spend Rs. 500, you are not much nearer your aim. The man's capacity has been diminished by that amount and the desired work has not been done. That provision of the law is effective against an offence of commission such as the levy of fees for

grazing which ought to be free, but it is hardly effective against a passive omission, especially when the omission is, as it may be, beyond the pecuniary resources of the person concerned to repair. One thing is certain that any fine levied for refusal to repair a tank, should be at once applied to the repair of that tank, and this point should be noted for any special legislation which it may be found necessary to recommend for the furthering of irrigation.

39. But this will go a very small way to help us, as we shall be able to deal only with a few isolated cases of landlords who are able, but neglect, to repair their tanks. It will not help us in the case of those who are really unable to spend money, or in the case of tanks in which it is improvement, not merely repair, that is needed.

It has been given in evidence that a great deal could be done to improve village tanks. Their sluice arrangements are primitive, or altogether wanting; their catchment areas are too large or too small. At a moderate cost their protective value might be improved. The owner is perhaps not equal to the task or cannot afford it. The Government derives at least half the extra rental value which irrigation may add to the assets, and might not unreasonably assist in the improvement of the tanks by contributing half the cost. It then need give no exemption for any improvement effected, as it will derive only half the rental value of the total increase which the improvement may ultimately secure.

40. It is of course a large undertaking to assist in the improvement of village tanks, and the best plan would be to allot a definite annual sum for this purpose. It occurred to me that the additional rate of 2 per cent. on the land revenue, which is taken in this province as a local cess only might very properly be allocated for this purpose.

The Act which imposed this rate was not ready to hand when I put this view before the Commission, but I have since refreshed my memory by reference to this Act, X of 1878, and it seems to be clear that this fund can easily under the existing law, be so utilised.

The preamble runs "whereas in order to defray the expenditure incurred and to be incurred for the relief and prevention of famine, it is necessary to make a permanent increase to the annual revenues, and it is therefore expedient to provide, in the territories administered by the Chief Commissioner, for the levy of additional rates on land, &c., &c."

Section 4 runs "the proceeds of all rates levied under this Act shall be carried to the credit of the Local Government."

Section 5 runs "from the sums so credited, the Chief Commissioner shall from time to time appropriate such amount as the Governor-General in Council may direct for the purpose of increasing the revenues available for defraying the expenditure incurred or to be incurred for the relief and prevention of famine in the said territories; or if the Governor-General in Council so directs in any other part of British India. The residue of the said sums after such appropriation may be applied by the Chief Commissioner, subject to the control of the Governor-General in Council, to such local works likely to promote the public health, comfort or convenience as the Chief Commissioner thinks fit."

Now it may be doubtful whether irrigation tanks could be held to fall within the definition of works

"likely to promote the public health, comfort or convenience," but funds used for such tanks might certainly be held as fit appropriations for the "prevention of famine." I am unaware exactly how these Local Funds are treated in the accounts, but they appear to be credited to the Provincial Funds, and the manner in which they were used appears to have been lost sight of. These local rates amount to Rs. 1,80,000 annually, and the appropriation of this sum to the improvement of protective village works appear to me to fulfil the avowed object for which they were imposed

Which would also be popular in the very fullest sense. The levy of this rate has always been unpopular with the people but it would greatly reconcile them to it if the funds were spent for village improvements.

41. If we are to undertake this work a special establishment with an Agricultural Engineer at the head of it would be very necessary. The fund should

Creation of an Engineering Branch in the Agriculture Department.

reach two lakhs in a few years' time, and half a lakh would give us an efficient establishment specially trained for the class of work required of it, leaving a lakh and a half for local improvements. On the basis that proprietors contributed half of any outlay required with the aid of takavi, or otherwise, an annual expenditure of three lakhs would be the outlay possible for small works, an amount which is by no means to be despised. In allotting the funds to the several divisions and districts, it would not be necessary to allot to each division or local area the precise amount of the rates they paid. A fund which is raised for the prevention of famine would naturally be devoted to areas which are most insecure; but it would be wise policy to devote a portion to the bunding of fields where such work was expensive, to the reclamation of ravine land, or to small *tars*, allotments being made, of course, on the basis of an equal expenditure of private money on the work. No district should be left out in the cold altogether, but money should preferably be devoted to cases in which the total cost of the improvement was beyond the means of the private owner.

42. As already stated further back in this Note, a private owner who is quite ready to make a tank or *tar* is often impeded by want of command of the land. The improvement will submerge some one else's land, or the *tar* or contour drain has to cross over the fields of a neighbouring village. Negotiation, even when backed by the moral suasion of a Revenue Officer are liable to fail. It will therefore be necessary to give power of acquisition in such cases with safeguards that the advantage to be gained by the improvement by the village community benefited must be proved to be largely greater than the loss to the individuals or the community who are deprived of land; that the compensation calculated is deposited with the Revenue Officer before the work is commenced; and with sufficient security that the work will actually be carried out. I do not think that it would be found impossible to devise safeguards of this kind, and many useful projects might be carried out which are now impossible because of the dog-in-the-manger attitude of the person whose land is prejudicially affected, perhaps very slightly, by the proposed improvement. It would also be necessary for the owner of the tank to acquire land for a distributary channel when private negotiation failed.

43. There is still one other case to be considered — that in which powers of acquisition should be reserved to the State. If the owner refused to repair a tank, or to take takavi for the repair, or to find half the funds in supplement of a grant-in-aid, it might be necessary in extreme cases for Government to acquire the tank. In that case it would be necessary to revise the terms of the settlement in such a way that the rental value derived by reason of the tank might be separated off and made payable directly to the Government. The threat of acquisition would suffice to bring most proprietors to their senses. Our hands require strengthening in this matter.

44. Another form of acquisition would be a temporary acquisition in an emergency, if the landlord refused to give water to those entitled to it at a time of drought. This power would be useful upon occasion, though its exercise would only be possible in a few cases. Action under it would be a matter of a few days, while enquiry would take time, and could not be entrusted to subordinate officials.

45. Some officers are afraid that State aid and interference of the kind suggested will demoralize the people and discourage private effort. This depends on the discrimination with which the aid is given; and under the system which I have roughly sketched above, aid will only be given to those who help themselves; while the unworthy and incapable are to be ousted, not aided. At the same time encouragement must be given to improvements carried out entirely from private funds. There are two sorts of encouragements usually recommended — one is exemption of improvements, the other free distribution of takavi.

46. I understand that in some provinces perpetual exemption of improvements is already the rule, while the late Famine Commission recommended its general adoption.

With much respect I venture to dissent from this proposal. The value of an exemption from assess-

ment as an inducement to improve is in my opinion exaggerated. To begin with, it is not an inducement at all. The inducement is the profit to be made from the improvement. The fear of assessment may be a deterrent. Exemption is, therefore, the removal of a deterrent. A man with a revenue-free holding in perpetuity has no such deterrent before him, yet experience does not show that he spends more on improvement of his land than his fully-assessed neighbour. Quite the contrary, he spends less because he has not the same pressing desire to increase his income.

I need not enlarge upon the fact that the effect of such exemption is obscured by the enhancement imposed on general grounds; this has been made abundantly clear by the evidence. Our assessments are so light, that the difference made by the exemption cannot affect a man one way or the other.

Apart, however, from this question, it is unreasonable that a man who once spends a comparatively small sum on applying certain natural facilities should be for ever exempt from paying the State a share of the profits to which these natural facilities as well as his application have contributed. At any rate, the privilege of perpetual exemption should be confined to works of most exceptional cost and enterprise. Some recommend a fixed term of exemption in place of the present rule — the exemption for the remaining term of settlement and for one settlement after.

There is great administrative convenience in terminating the exemption with the expiry of a settlement. For if you had a fixed term of years, and 50 people made wells in a village in different years, you would have to prepare a record showing the enhancement to which each was liable and the date on which it would come into force. In that event if the people were tenants, there would have to be a perpetually progressive assessment of irritatingly pretty sums. To judge from our experience of ordinary *muafis*, there would be constant cases of delays in bringing these extra demands on to the books, with consequent annoying recoveries of arrears.

46. It would be preferable to fix a term — say 30 years (or 50 years in the case of large works) and to the end of the settlement current at the expiry of that period. This would be a most ample time for such improvements as wells, bunds and small tanks, i.e., such improvements as would be in the capacity of a tenant.

For the large works I would recommend exemption as abovementioned, retrospective remission of the revenue of any land submerged by the tank, and as an additional and sentimental inducement a grant (*takum* or *ubari*), either, as proposed by Mr. Sly, of a perpetual quit-rent on the land improved, fixed at a proportion three-fourths or seven-eighths of the *kamajama*, or, as suggested by Mr. Low, of a similar revenue-free grant for two lives fixed at some proportion of the area improved. This concession would apply to plot-proprietors and *malguzars*, but not to tenants. The *muafi* concession would be conferred with retrospective effect as soon as the tank was completed, and would continue so long as it was maintained in repair. The concession would also be personal to the grantee and his heirs, and should not continue in favour of a transferee. It is seldom that an owner of this kind voluntarily transfers the land he has improved. If he loses it, it is because he is involved in debt, and he loses it almost always below its full value. Moreover, the revenue-free grant is intended to have a sentimental value in the eyes of the man who made the improvement and his family. It is not intended as a pecuniary benefit with a transferable pecuniary value.

47. The next point to be considered is *takavi* for Land Improvement. With the exception of the year 1896-97, in which famine loans to the aggregate amount of 11½ lakhs were given out. *Takavi* operation for land improvement have always been on a small scale.

Originally no doubt, applications were few, and only small allotments were asked for. Later on perhaps small allotments have discouraged applications. Applications are made very commonly in the early hot-weather.

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The financial year is over before the enquiries are complete, and some time elapses before the next year's allotment is made known. Delays of this kind are one discouragement, but I don't think that they count for much. A large loan is not to be negotiated in a hurry, even in the case of a private money-lender. It is also the fashion to say that severity of collection affords a discouragement. Loan instalments should always be suspended if the season is such as to require suspension of revenue, but there is little advantage in making the instalments repayable in the next year. If one instalment has to be suspended, it should be postponed till after the last instalment.

Too early repayment is the real discouragement.

Save, however, for severity in a year of losses, I do not think that the demand for repayment is much of a deterrent to men taking loans. The real deterrent consists in making the first instalment repayable too soon. The rules permit of the first instalment being fixed three years after the receipt of the loan, and this procedure should be followed, and the term extended to five years when necessary. The rules also allow a maximum term of 35 years for repayment. So long a term is only necessary in the case of very large loans given for expensive works. Fifteen years should be the ordinary term. It has been the fashion to fix three, five, nine and sometimes ten, but more often the shorter periods. The applicant is asked when he will repay the loan. A borrower is always sanguine about the time in which he can repay a loan, and he mentions a short one as an inducement to getting it. Very long terms are unnecessary and risky in the case of tenants of short standing or small status, and the security for advances is weakest when the country is deteriorated and the demand is for tenants and not for land.

48. The Land Improvement Loans Act requires certain formalities, such as local notification and the hearing of objections (section 5), and the Government is bound to be satisfied that the security offered is adequate. It has been stated in evidence that the rules do not permit of sufficiently large advances being made. But Rule 7 allows the loan to be made to the full value of the land for which it is taken or of the landed security offered by sureties, and the Commissioner may even sanction a larger amount than this.

It is true that in the case of occupancy and ordinary tenants, Rule 9 requires the joint personal security of not less than three occupancy tenants, and the loan cannot (without the Commissioner's sanction) exceed three times the total rental of the tenants who offer security. But since that rule was framed the Tenancy Act, sections 46 (3) and 70 (3), specially provides for the sale of the holdings of occupancy and ordinary holdings in recovery of Government loans. This therefore enlarges the security which such tenants can offer whenever their land has a market value.

The land for the benefit of which the loan has been granted can be sold free of all encumbrances, vide section 7 (c) and the proviso to that section. The only question is what is the land included under that term. When a tenant improves one field in his holding, does the whole holding constitute the land for the benefit of which the loan has been granted? and in the case of a malguzar does the term comprise the whole village? I am not aware that this question has ever been judicially raised, but it is one that might be raised at any time, and one therefore which should be made clear.

49. Another matter in connection with these loans that is often raised is the interest. The Chief Commissioner may sanction loans at a lower rate of interest or free of interest altogether, and the Commissioner may order that the running of interest may be delayed "until a date which shall precede by at least six months the date fixed for the repayment of the first instalment of principal." Otherwise the interest runs from the date of the loan and is not less than 6½ per cent., and the Deputy Commissioner may charge 12½ per cent. on any instalment of principal or interest that is not paid in time. I have no belief in penal interest, but in all other respects the rules as to interest appear to be sufficiently liberal. The rate is well below the prevailing rates at which money can be borrowed from private lenders, and has certainly not deterred would be borrowers.

Moderate but penal interest is a mistake.

50. On the whole, then, it appears that the rules offer sufficiently attractive terms if full advantage is taken of them, but it might be well to give more power to the Deputy Commissioner. The necessity for obtaining sanction may deter him from offering more favourable terms, and gives the impression that the more liberal concessions are to be applicable only to exceptional cases.

There is in my opinion a great field for the extension of land improvement loans in this province, if the terms for repayment are made more liberal than has been the existing practice, and if these terms are properly published in the villages. But I would advocate a gradual increase. It is a mistake to press loans on unwilling recipients, and just at this moment the people are impoverished and indebted, and unwilling to add to their obligations.

In normal years the sums advanced over the whole province seldom exceeded Rs. 30,000, but of late years the famine loans, which are really land improvement loans offered under special terms, have confused the accounts. I would estimate, however, that we could in the near future distribute four or five lakhs annually over the province, but progress must be cautious, for there is great risk that loans would be misapplied to payment of creditors, and supervision becomes difficult as loans become very numerous. We must also be prepared for disappointments. If an annual allotment of five lakhs were made, it would never do to reduce it, because in the first two or three years it was not fully distributed.

Special officer not generally required. I am not much in favour of a special officer being appointed for the distribution of these loans. The Deputy Commissioner and his Executive Assistants should be able to do what is required, but if in any district or at any particular time applications for the loan became very numerous, it would be easy to detail an officer on special duty to deal with them.

51. Reference has been made in the course of the Commission's inquiry to the advisability of lending the services of professional well-borers in tracts where it is desired to push well irrigation. This would be a kind of work on which expenditure would be justified from the Provincial Improvement Fund, provided that such a staff was procurable, at all events in the beginning. If the staff was found to be satisfactory, there is no reason why well-to-do people should not pay for its services at a tariff to be fixed by the Agricultural Department in all cases in which the operations were successful.

Similarly, if we have an Agricultural Engineer with a skilled establishment it might be put at the disposal of private individuals for the purpose of giving advice or of making surveys, a charge being made for these services to be credited to the Fund in the case of all well-to-do persons. Services of this kind would be specially valuable to our Courts of Wards, which are often unable to undertake important works for fear of wasting their wards' money on some ill-considered or ill-carried out scheme. The large solvent estates, the only ones in which important projects can be undertaken, could well afford to pay for this professional assistance.

52. My recommendations under head III of this Summary of recommendations. Note may therefore be summarized up as follows:—

I.—The construction of a Local Famine Prevention Fund to which would be credited—

- (a) The proceeds of the present additional rates.
- (b) Any fees paid by Court of Wards' estates or by private persons to the Agricultural Department for advice, surveys, or professional assistance.
- (c) Any fines imposed on malguzars who refuse to carry out their obligations regarding tanks.

II.—The addition of an engineering branch to the Agricultural Department to be charged to the Fund mentioned above.

III.—The balance of the Fund to be devoted to

grants-in-aid for agricultural improvements equal to half the cost of such improvements.

IV.—Enlarged powers of land acquisition for the improvement of village tanks, and to give temporary control over distribution of water in emergent cases in times of drought.

V.—Exemption of improvements for a fixed minimum term of 30 years or 50 years according to circumstances.

VI.—Special rewards in the shape of proportional quit-rent or revenue-free grants for specially costly works on a scale to be determined, to be given on completion of the work with such retrospective effect as is necessary.

VII.—The encouragement of *takavi* by longer terms for repayment, postponement of first instalment to three or five years, and by suspension of instalments in the event of crop failure, effect being given to each such suspension by putting on all subsequent instalments by one year.

IV.—The immediate practical steps to be taken to give effect to the objects desired.

53. The construction of irrigation works which the Government may decide, upon the recommendations of the Commission, to undertake as State works must necessarily be spread over a long term of years, and such funds as may be allotted annually should therefore be devoted to the most urgent works, that is to say to works in the tracts which most need protection.

The selection of tracts to which money should first be applied must therefore be the first duty. Having done this we shall see which of the projects already prepared fall within these tracts. If any of those tracts are either not protected at all, or are imperfectly protected, investigation must be directed to projects in them if such are possible.

Construction will follow in the same order, but the programme must be well ahead of construction, so that in the event of famine occurring, relief works may be selected to the best advantage. The projects already drawn up in a preliminary stage must be put into a final shape, if local examination and consultation with Revenue officers show that they are worth constructing. But information has to be obtained and a decision made in respect to such matters as the duty of water, the standard tank capacity to be adopted with reference to the rainfall, the degree of protection to be aimed at, and the proportion of protection which will stave off famine in any tract or group of villages.

54. So far as immediate construction is concerned we have in Raipur and Bilaspur a number of unfinished works commenced in the famine which should clearly be completed. We have learnt from the Chhattisgarh officers that these works are eminently suited to give protection to types of villages which are most liable to failure, even though they may not be situated in the tracts over which as a whole failure was most general. They are ready to hand; the fresh expenditure to be incurred is not large, and they will give us admirable experience. Let them be completed as soon as is possible. But let not completions of projects from preliminary to final stages or investigation come to a standstill meanwhile.

We must have a district irrigation scheme just as we have a district road scheme, and just as roads in the road scheme can be readily transferred on to the famine programme, so will it be with works on the irrigation scheme.

These are the measures necessary with reference to major works to be executed by the State; but there is an extensive village work programme to be prepared, which will include the minor works capable of being constructed as village works in famine time, and of being gradually carried out from the local Famine Prevention Fund in anticipation of famine.

55. The measures summarised under part III of this Note in paragraph 52 are capable of being introduced at a very early date, and there need be no delay in respect to all which do not require legislation; that is to say, all except those which refer to the acquisition of land for private works.

Legislation will certainly be necessary both for the control and management of State works, and for obtaining the powers of acquisition which I have indicated in respect to local works. But this is too important a measure to be hurriedly pushed through. It is possible to indicate general lines; but further experience and much discussion are necessary before details can be determined. Opinions may, however, be invited on the general lines, and I should be disposed to recommend a short special Act in preference to amendments of existing Acts. Our Land Revenue Act is already encumbered with unwieldy interpolations and amendments, and the inter-dependence of public and private irrigation in this province will make it difficult to meet its needs by amendments or additions to the Northern India Canals Act.

56. I will now bring this note to a close by roughly indicating for each district what scope exists for extension of protection in one shape or another to the distinctive parts of each.

Saugor.—There are 25,000 acres of rice in this district, of which all but a small fraction is irrigated. Local enquiry is needed as to whether this can be usefully protected or extended, and whether rice can be substituted for some of the area (82,000 acres) cropped with the hill millets. But apart from this the chief scope lies for improvement of kharif cultivation, cotton and juar, on well-devised sites; for the extension of well irrigation (over 3,000 acres of wheat were irrigated in 1900-01); and lastly, and chiefly, for the extension of bunding of wheat fields. Improvements are especially needed in the Khurai Tahsil, where past failures have been most severe, and *kāns* has most extended.

I believe also that the Khurai Tahsil comprises most land of the kind for which canal irrigation has been attempted in the adjoining districts of Bundelkhand, by means of the Betwa canal, the results gained by which would be of much interest.

Damoh.—This district is divided into well-marked *haveli* and *non-haveli* areas. The Central tracts, which are chiefly black-soil wheat land, offer the most favourable field for the extension of bunding, which has already made some progress. There is also scope for well irrigation to be extended.

In the *non-haveli* portion of the district there is a rice area of over 70,000 acres, while another 70,000 acres are cropped with hill millets. There is considerable scope for the irrigation of this rice land, and of the wheat land adjacent to it.

Jubbulpore.—There are no less than 220,000 acres of rice land in this district, of which about 120,000 acres are doubled-cropped, and provided for by the bunded fields. For the rest irrigation is desirable, and it should be possible to convert into rice land, or to substitute better cropping for some of the area (194,000 acres) now growing *kodon* and *kutki*. Most of the wheat area is protected by bunds. But these can be further extended, and the two systems can be developed.

The tracts most liable to suffer from drought are the Murwara Tahsil and the Kundum and Bargi Circles.

Mandla.—Agriculturally the most backward district in the province, over 60 per cent. of the population being aboriginal. As about half the district is held on ryotwari tenure, the State has special obligations in respect of it. Over a limited area it has land like that of the Jubbulpore *haveli*, but for the rest there is a great deal of poor hilly land. There are over 80,000 acres of rice and 220,000 acres of hill millets. There exists very considerable scope for additional rice cultivation; juar and cotton are practically unknown in the district, and their introduction seems desirable. Well irrigation is very scanty, and the people have very little capital; but the district suffered much more in 1896-97 than in 1899-1900.

Seoni.—The southern and south-eastern portion of this district contain rice land akin to that of Balaghat and capable of being greatly secured by irrigation. In the rocky Lakhnadon Tahsil it might be possible to extend juar, and perhaps cotton; and there

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should certainly be room in the valleys for much more well irrigation. The *haveli* tract on the Chhindwara border might offer a field for bunding. This and a corner of the district situated below the ghats did fairly well in both famines.

Narsinghpur.—Bunding of wheat is well known in this district and is capable of much extension especially in the Gadawara Tahsil. In the south of the district at the foot of the Satpuras there is a light-soil tract which offers a field for irrigated rice. The area now unirrigated is 26,000 acres, and this part suffered greatly in the droughts while the central area of the district escaped very lightly. There is a light-soil area in the Gadawara Tahsil which it might be possible to help by *tars*.

Hoshangabad.—In this district the protection of the wheat crop should be the first consideration, chiefly by bunding, and to some extent by wells and tanks. The Sobagpur Tahsil contains the lightest soil, and the so-called black soil of the tahsil might be found to take irrigation, if any good projects can be found. In the west of the district better cultivation of kharif crops is a possible improvement deserving encouragement. The district became too dependent on wheat, and has suffered for this. Rice is not important; but there is a strip of land along the Tawa in which wells might be increased.

Nimar.—Well irrigation for the cultivation of wheat in the valleys, and for the protection of the kharif crops elsewhere, is practically the only form of irrigation which is promising. Within limits this is the part of the province in which wells can be pushed most.

Betul and Chhindwara above the Ghats.—Wells are capable of extension in these districts, and in the level light soils there might be much scope for the introduction of rice with irrigation. Experiments are necessary. Northern Betul below the Ghats should offer some good tank sites. In the level portions of the plateau in Betul there is a very good field for extending well irrigation, and sugarcane cultivation might revive. The Chaurai and Linga tracts of Chhindwara contain some level wheat land similar to that of the Seoni *haveli*, in which bunding might be tried. The area of rice in these two districts is insignificant; that under hill millets is very large.

The Sausar Tahsil or Chhindwara below the Ghats is similar to the cotton-juar country of Nagpur, and affords scope for well irrigation.

Wardha.—The Arvi and Wardha Tahsil are cotton-juar tracts: well irrigation might be extended, but nothing else can be done. In the Hinganghat Tahsil, there is a rabi area in which the bunding of fields might be tried as an experiment.

Nagpur.—In the west of the district there is a cotton-juar tract. There is good well irrigation which can be extended. In the centre and south of the district, there is a large area of wheat land, part of which is favourable to bunding. The east of the district presents features similar to those of the adjacent rice country, and there is scope for rice irrigation.

57. Bhandara, Balaghat, Chanda, Raipur, Bilaspur and Sambalpur.—These are the great rice districts of the Province, and it is in these that the greatest field is open for tank irrigation, large and small. So much has been said about them both in this note and in the evidence before the Commission, that it is unnecessary to repeat details here. But a few words are necessary in respect of Sambalpur. That district is composed almost entirely of light soil. Its climate is on the whole more secure, since the cyclonic storms of September and October, which move away to the north-east and leave the bulk of the Province untouched, frequently give Sambalpur rain. The configuration of the country and its soil afford facilities for irrigation, and the attitude of the people towards irrigation more resembles that of the Wainganga districts than the rest of Chhattisgarh. Unlike Raipur and Bilaspur, the district is not hampered by the remains of the *lakha-bhata* system which so impedes improvements in Raipur and Bilaspur; but on the other hand its tenure is such that the private owners have no interest in making tanks except such as improve their own *bhogra* or home-farm. Large irrigation works are perhaps less necessary in Sambalpur than elsewhere, but the districts should not be entirely neglected in any scheme of improvement which may be adopted for the Province at large.

Special remarks regarding Sambalpur.

58. As regards the scattering of fields which has resulted from the old *lakha-bhata* system in Raipur and Bilaspur, it is difficult to know what to suggest.

The present law would recognize the exchange of tenures which a final redistribution of fields would entail; and if all the parties concerned would agree, the operation would be legal. But the idea of such a distribution has faded though the results remain, and the difficulties in the way of a compulsory redistribution would intensify several hundred-fold those which are encountered in the division of *sir* land in a partition proceeding. Gradual action by pressure brought to bear on *malguzars* seems the only course, but if the idea caught on it might rapidly develop.

59. Q. Two statements are attached to this Note showing respectively, the details of irrigation in 1900-01, and the total figures of certain distinctive years.

In 1900-01 the decrease in irrigation is in great measure due to the decrease in rice cultivation and want of seed and resources. In Chhattisgarh the returns of the last few years have been disorganized by settlement operations and famines, and confusion has arisen with reference to the area which is irrigated by percolation (the *pajra*). In other parts of the Province, however, the statistics are more reliable, and show how irrigation is resorted to in normal years and how village tanks are apt to fail when they are most wanted in years of drought. A very brief memorandum showing the advantage in crop outturns which embankment or irrigation will give is also added.

STATEMENT I.—Showing the Irrigated Areas in 1900-01.

District.	IRRIGATION BY SOURCES.			IRRIGATION BY CROPS.			TOTAL.
	Tanks.	Wells.	Other sources.	Wheat.	Other cereals and pulses.	Miscellaneous crops.	
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Saugor	107	6,314	657	3,358	2,004	1,721	7,078
Damoh	17	1,625	460	596	277	1,229	102
Jubbulpore	59	2,384	447	496	105	2,239	2,840
Mandla	30	372	586	25	...	968	998
Seoni	13,608	445	522	36	13,610	929	14,575
Narsinghpur	1	2,548	295	1,203	76	1,565	2,844
Hoshangabad	13	4,168	847	2,678	196	1,703	4,577
Nimar	70	14,369	458	10,630	775	3,492	14,897
Betul . . . . .	...	7,650	807	4,687	1,030	2,740	8,457
Chhindwara	82	7,724	820	4,270	506	3,300	8,076
Wardha . . . . .	...	3,541	7	770	151	2,627	3,545
Nagpur	11,133	10,701	151	2,818	11,465	7,707	21,985
Chanda	72,046	2,066	2,924	48	73,173	3,815	77,036
Bhandara	165,475	2,844	1,552	109	165,119	4,643	169,871
Balaghat	32,837	2,123	1,133	27	32,823	2,253	35,103
Raipur	9,032	2,547	2,123	17	9,194	4,301	13,513
Bilaspur	604	803	434	...	34	1,307	1,341
Sambalpur	10,149	2,584	953	108	7,329	6,249	13,666
Whole Province	818,512	74,258	12,746	31,866	317,867	52,783	402,516

STATEMENT II.—Showing the Total Area irrigated in—

(a) Wet year before the famine—1894-95.

(b) Dry year before the famine—1895-96.

(c) Famine year of 1896-97.

(d) Famine year of 1899-1900.

(e) After the famine—1900-01.

DISTRICT.	(a) 1894-95.	(b) 1895-96.	(c) 1896-97.	(d) 1899-1900.	(e) 1900-01.
	Acres.	Acres.	Acres.	Acres.	Acres.
Saugor	6,810	6,860	6,521	6,582	7,078
Damoh	2,171	2,188	2,020	1,972	2,103
Jubbulpore	2,902	3,036	3,199	3,137	2,840
Mandla	1,196	1,078	1,034	809	988
Seoni	27,303	27,615	21,077	2,492	14,575
Narsinghpur	2,357	2,973	3,566	2,666	2,844
Hoshangabad	2,661	3,509	3,998	4,110	4,577
Nimar	12,251	12,202	11,011	5,309	14,597
Betul	7,545	8,127	12,056	6,777	8,457
Chhindwara	5,411	7,853	92,892	6,702	8,476
Wardha	2,402	2,840	3,957	2,589	3,548
Nagpur	22,996	23,631	24,124	10,307	21,955
Chanda	148,855	147,416	159,472	26,554	77,026
Bhandara	241,350	246,364	216,467	45,176	169,871
Balaghat	102,998	98,356	58,439	16,190	35,108
Raipur	22,453	37,102	63,408	26,227	13,512
Bilaspur	4,178	54,236	79,574	23,316	1,341
Sanbalspur	9,446	82,697	111,271	64,349	13,686
Whole Province	624,785	761,821	790,576	254,264	402,516

Memorandum showing extra yield or valuation resulting from (a) Embankment of wheat, (b) Irrigation of rice.

(a) EMBANKED LAND.

In Damoh and Jubbulpore the yields of wheat on embanked as compared with ordinary level fields on black soil is computed to be 840 to 640, and the conclusions in Narsinghpur appear to bear this out. The difference is a little greater on slightly inferior soil. In a dry year, however, the difference would be a good deal more—probably 600 to 300. In wet years, if there was rust, the embanked land would suffer more, but the larger net profits resulting from embankment have been held to justify the following differences in factors:—

Jubbulpore . . .	+50 per cent.
Damoh . . .	+50 per cent.
Narsinghpur . . .	+33 per cent.
Seoni . . .	+25 per cent.

These factors are based on the three considerations—the result of crop experiments, differences in existing rents, and the opinion of the people.

(b) THE IRRIGATION OF RICE.

The rice cultivation of Seoni as carried out by the Powars is as good as any to be found in the Province.

The conclusions formed by the Settlement Officer were that the yields of first class irrigation stood to the dry crop as 2,000 to 1,200 in good soils = +66 per cent., and as 1,600 to 800 in the poorest ones = +100 per cent. When compared with the crops grown in high-lying fields the difference was greater—100 per cent. in good soils and 200 per cent. in poor ones. These advantages would be largely increased in dry years.

The ratios in Balaghat are—

Irrigated.	Dry.	High-lying.
150 ::	100	100
200 ::	100	50

These results may be accepted generally for the Wainganga districts.

In Chhattisgarh the irrigation of rice has not been extensive enough to afford any reliable data as to the excess of irrigated over unirrigated rice in an ordinary year. Irrigation is not judged to give much increase over the lowest lying *bahras* lying at the bottom of a depression, but over the ordinary rice land the excess is estimated in Raipur as from 50 to 66 to 100 per cent. according to soil.

The Bilaspur results appear to be much the same, the advantages of irrigated over *bahra* being, as in Raipur, small. In fact the *bahra* receives from its situation most of the surrounding drainage, and is practically irrigated.

In Sambulpur irrigation is more appreciated and the outturns are estimated in the Settlement Report—

	Irr.
Irrigable . . .	1,900
Bahal . . .	1,700 (This is the <i>bahra</i> of Raipur and Bilaspur.)
Berna . . .	1,500
Mal . . .	900

By irrigation it would be possible to raise the yield of *mal* land to those of *bahal* at least.

On the whole it may be said that if the average level rice fields be taken, irrigation will increase the yield by never less than 33 per cent., by generally 50 per cent., rising to 66 per cent., and 100 per cent. when the soil is light; and in times of drought it will make the difference between a fair crop and none at all.

Questions for Revenue Officers, including Officers of the Public Works Department who have had experience in the administration of water-supply.

1. To what district or tract do the answers below refer?

What opportunities have you enjoyed of becoming acquainted with it?

2. What is the average rainfall in each month of the year?

3. Is there any obstacle to the extension of irrigation arising from—

- (1) Sparsity of population?
- (2) Insufficient supply of cattle suited to the cultivation of irrigated land?
- (3) Insufficient supply of manure?
- (4) Unsuitability of soil, (e.g., black cotton soil) to irrigation?
- (5) Uncertainty of the supply of water, or its too late commencement or too early cessation?
- (6) Lack of capital for the initial expenditure or of funds for the more expensive cultivation of irrigated crops?
- (7) Fear of enhanced rent or revenue assessment?
- (8) Uncertainty of tenure or defects of the Tenancy Law?
- (9) Other reasons?

4. For what period, if any, is land which is irrigated from works constructed by private capital exempted from enhancement of assessment on account of the irrigation? How is the exemption secured in practice? Is any similar exemption from enhancement of rent extended to tenants who have extended irrigation to their holdings at their own cost? Do you consider that the existing provisions in this respect are sufficiently liberal? If not, what alterations would you suggest?

5. Are loans under the Land Improvement Act freely taken by the people for the extension of irrigation? If not, why not, and what measures would you suggest for the encouragement of these loans? Would you recommend?

- (1) Reduction of the rate of interest?
- (2) Remission of the interest?
- (3) Partial remission of the advance?
- (4) Total remission in case of failure of the attempt to obtain water.
- (5) Extension of the period of repayment?
- (6) Grants-in-aid?

6. Does the extension of irrigation tend to injure the remaining cultivation by attracting its cultivators to the irrigated tracts?

Can you give any instance of this which has come to your knowledge? Is there any strong desire evinced among the people of your district to have means of irrigation extended to it or increased?

7 to 11—

B.—Canals of continuous flow.

C.—Canals of intermittent flow.

12. Please describe generally (3) the period for which the supply is ordinarily maintained—

- (a) In a year of ample rainfall?
- (b) In a year of scanty rainfall?
- (c) In a year of drought?

23. Please describe generally—

- (1) The way in which the tanks in the district are supplied with water.
- (2) The manner in which the water is distributed to or utilised upon the land.
- (3) The period for which the supply is ordinarily maintained.
 - (a) In a year of ample rainfall.
 - (b) In a year of scanty rainfall.
 - (c) In a year of drought.
- (4) The area ordinarily irrigated from a tank.

24. To what extent does the irrigation increase the value of the produce of land.

- (1) By rendering it possible to cultivate two harvests instead of one?
- (2) By leading to the substitution of more or less valuable crops or varieties?
- (3) By increasing the yield—
 - (a) In a year of ample rainfall?
 - (b) In a year of scanty rainfall?
 - (c) In a year of drought?

25. How far is the value of the irrigation diminished by—

- (1) The too late commencement?
- (2) The too early cessation of the supply?

26. Is the irrigation ordinarily supplemented by irrigation from wells given to the same land, and if so, how far is this essential?

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27. Can you give an approximate estimate of the increase in the total annual value of the produce per acre due to the irrigation—

- (1) On the average of a normal term of years?
- (2) In a year of drought?

28. What is approximately the average annual rate per acre paid on account of irrigation—

- (1) By the cultivator (or the owner?) of the land to the owner of the canal in the form of water-rate, or otherwise?
- (2) By the cultivator to the owner of the land in the form of enhancement of rent, or otherwise?
- (3) By the owner of the land to the Government in the form of enhancement of revenue, water-advantage rate, owner's rate or otherwise?

In each case, please state whether the rate is paid on the area actually irrigated during the year, on the area ordinarily irrigated, on the whole irrigable area, on the total area of the holding, or how?

29. What, if any, private expenditure is necessary to bring the water to the field, or to prepare the land for irrigation? Is this generally incurred by the landlord or by the tenant? If by the latter, what security has he for recoupment?

30. How is the maintenance (watering, repairs, silt-clearance and the like) provided for? What is the approximate annual cost per acre irrigated? Does the system work fairly well, and is any legislation required?

31. In the case of tanks constructed by a private person or persons, how is the distribution of water to the other owners of land regulated or arranged for? Has any trouble arisen in this respect, or in connection with the realization of water-dues? If so, is Government assistance advisable, and is any legislation required?

32. Do you consider it advisable to encourage and assist the construction by private persons of further tanks; and, if so, how could this best be done?

33. Is much inconvenience experienced from the liability of tanks to silt up? Can you give any statistics as regards the depth of silt accumulation per annum? Is it the custom to remove the silt by dredging or otherwise? If not, what steps are taken to prevent the ultimate silting up of the whole tank?

34. Please state generally, for each of the main tracts into which the district is divided—

- (1) The average depth of permanent wells;
- (2) The nature of the supply, whether from springs or from percolation, and whether liable to fail or become too saline to use—
 - (a) In an ordinary year.
 - (b) In any year of drought.
- (3) The average cost of construction?
- (4) The average duration of a well?
- (5) The manner in which the water is usually raised?
- (6) The average area attached to and commanded by a well?
- (7) The average area irrigated in any one year.

35. To what extent does the irrigation increase the value of the produce of land—

- (1) By rendering it possible to cultivate two harvests instead of one.
- (2) By leading to the substitution of more for less valuable crops or varieties.
- (3) By increasing the yield—
 - (a) In a year of ample rainfall?

(b) In a year of scanty rainfall?

(c) In a year of drought?

36. Can you give an approximate estimate of the increase in the total annual value of the produce per acre due to the irrigation?

- (1) On the average of a normal term of years?
- (2) In a year of drought?

37. What is approximately the average annual rate per acre paid on account of the irrigation—

- (1) By the cultivator to the owner in the shape of enhancement of rent?
- (2) By the owner to Government in the shape of enhancement of revenue?

38. Are serious difficulties often encountered—

- (1) In the selection of a spot in which a supply of water will be obtained?
- (2) In the actual construction of a well?

Has assistance ever been offered by Government or by Local Bodies in the shape of expert advice, trial borings, the use of boring tools, or otherwise? If so, how far has this assistance been made use of and found successful? If not, do you think it would be useful, and how could it best be given?

39. Are you in favour of the construction by Government of wells in land which is private property? If so, how would you work the scheme? If not, what objections do you perceive?

40. Are temporary wells commonly used in the district? How far are they a protection against drought? How would you propose to encourage their construction in a year of scanty rainfall?

41. Describe the system of bunded wheat fields on black cotton soil.

42. Please state generally, for each of the main tracts into which the district is divided—

- (1) The average size of the fields and height of embankments?
- (2) The nature of the supply?
- (3) The average cost of construction?

43. To what extent does the irrigation increase the value of the produce of land—

- (1) By rendering it possible to cultivate two harvests instead of one?
- (2) By leading to the substitution of more or less valuable crops or varieties?
- (3) By increasing the yields—
 - (a) In a year of ample rainfall?
 - (b) In a year of scanty rainfall?
 - (c) In a year of drought?

44. How far is the value of irrigation diminished by—

- (1) The too late commencement?
- (2) The too early cessation of the supply?

45. Is the irrigation ordinarily supplemented by irrigation from wells given to the same land.

46. Can you give an approximate estimate of the increase in the total annual value of the produce per acre due to irrigation—

- (1) On an average of a normal term of years?
- (2) In a year of drought?

47. Is any difficulty experienced in dividing the separate holdings in a large bunded area.

48. Are you in favour of the State bunding fields? How can the State assist cultivators to bund them?